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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Colorado Field Office
P.O. Box 25486, DFC (65412)
Denver, Colorado 80225-0486

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JUL 25 2008

Rick D. Cables, Regional Forester
Rocky Mountain Region
P.O. Box 25127
Lakewood, Colorado 80225-0127

Dear Mr. Cables:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion on the effects of the Southern Rocky Mountains Lynx Amendment (SRLA) on the Distinct Population Segment (DPS) of Canada lynx (*Lynx canadensis*) (lynx) in the contiguous United States, in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (ESA). The Service received your request for consultation on May 7, 2008, on the supplemental biological assessment, which contains Alternative F-Modified as the proposed action. We completed an earlier biological opinion on September 7, 2007, on Alternative F, but due to changed conditions resulting from a major mountain pine beetle epidemic as well as clarification on timber management standards, the proposed action was modified and is now represented in Alternative F-Modified. This biological opinion replaces the September 7, 2007 biological opinion. The proposed action addressed in the September 7, 2007 consultation was never implemented by the U.S. Forest Service (Forest Service). A revised biological assessment (BA) was received in our office on May 27, 2008 (U.S. Forest Service 2008).

This biological opinion is based primarily on information provided in the May 27, 2008, BA (U.S. Forest Service 2008); various supplemental information supplied by the Forest Service and contained in this document or in our project file; the Lynx Conservation Assessment and Strategy (LCAS) (Ruediger et al. 2000); the Lynx Conservation Agreement of which the Forest Service and the Service are signatories (U.S. Forest Service and U.S. Fish and Wildlife Service 2005 and 2006); the Lynx Science Report (Ruggiero et al. 2000); and more recent research and information. We also considered information in our files, including, but not limited to, information related to the final listing rule (March 24, 2000; 65 FR 16052), the clarification of findings (July 3, 2003; 68 FR 40076), the final critical habitat designation (November 9, 2006; 71 FR 66008) and proposed rule to revise final critical habitat (February 28, 2008; 73 FR 10860), our remanded determination in our clarifications of findings of our

final rule (January 10, 2007; 72 FR 1186), the lynx recovery plan outline (U.S. Fish and Wildlife Service 2005), and various agency correspondence as part of our deliberations.

A complete record of this formal consultation is on file at the Service's Regional and Colorado Fish and Wildlife Offices. This consultation complements the Northern Rockies Lynx Amendment (NRLA) Biological Opinion, which was completed on March 19, 2007, and addresses National Forests in Washington, Oregon, Idaho, northern Wyoming, and Utah. The proposed action for the SRLA is very similar to the NRLA, with differences between the proposed actions generally reflecting the different habitat conditions that exist in the two areas.

The Service concurs with the Forest Service's determinations that the proposed action is not likely to adversely affect the following Federally-listed species: southwestern willow flycatcher (*Empidonax trailii extimus*) and greenback cutthroat trout (*Oncorhyncus clarki stomias*). The Service concurs with the Forest Service's determination that the proposed action will have no effect on the Mexican spotted owl (*Strix occidentalis lucida*), Uncompahgre fritillary butterfly (*Boloria acrocnema*), Penland alpine fen mustard (*Eutrema pendlandii*), and Osterhout milkvetch (*Astragalus osterhoutii*). We concur with the rationale for these findings found in the BA (U.S. Forest Service 2008). The bald eagle (*Haliaeetus leucocephalus*) is no longer protected under the ESA, and therefore is not addressed in this biological opinion.

Consultation History

On October 25, 2000, we issued a biological opinion on the National Forest Land and Resource Management Plans and Bureau of Land Management (BLM) Land Use Plans on Canada lynx in the contiguous United States. The Forest Service and BLM proposed to moderate the effects of the Plans on lynx on Forest Service and BLM lands until their management Plans could be amended to incorporate lynx management strategies. In the interim, the Plans would be implemented under the Conservation Agreements, which required the use of the best available information, including the LCAS, to determine whether projects were likely to adversely affect lynx or not. Projects that were likely to adversely affect lynx were deferred until Plans were amended to consider the conservation of lynx (with a few exceptions for third party projects). The 2000 biological opinion considered the effects of implementing the Forest Plans under the interim strategy (i.e., implementing the Plans under the Conservation Agreements) on a national basis and determined that its effects did not jeopardize the continued existence of the species, and in fact, constituted a benefit over the status quo (i.e., current Forest Plan direction). Furthermore, our 2000 biological opinion also concluded that if Plans were amended or revised to incorporate the conservation measures in the LCAS (see below), or an equivalent thereof, the Plans would not likely jeopardize the continued existence of lynx.

Thus, the Forest Service has increased lynx conservation efforts since 2000 on an interim basis, in part by following the Conservation Agreements (2000; 2005; 2006). The

Conservation Agreements were very conservative in that they required deferral of most projects that would likely adversely affect lynx, which was considered an appropriate interim direction until full consideration could be given to amending or revising Forest Plans to conserve lynx overall.

The 2000 consultation built upon the efforts of the National Interagency Lynx Steering Committee (comprised of representatives from the Service, Forest Service, BLM, and National Park Service [NPS]), a coordination effort that directed or resulted in the compilation of the following documents considered essential for understanding lynx ecology and implementing appropriate conservation measures on Federal lands:

(1) Lynx Science Report—A Science Team was selected to prepare a scientific report that amassed and interpreted all available scientific knowledge regarding Canada lynx, lynx prey, and lynx habitats. This report was first distributed to the public electronically in 1999, and subsequently published as a book entitled "Ecology and Conservation of Lynx in the United States." (Ruggiero et al. 2000). Hereafter, this publication will be referred to as the Science Report.

(2) Canada Lynx Conservation Assessment and Strategy—(LCAS) An interagency Lynx Biology Team used information provided in the Science Report to develop a conservation strategy for Canada lynx on Federal lands. This effort was initiated through an action plan approved by the affected Regional Foresters of the Forest Service, State Directors of the BLM, and Regional Directors of the Service by memorandum dated June 5, 1998. The LCAS was finalized in 2000 (Ruediger et al. 2000) and is currently being revised by the cooperating agencies.

(3) U.S. Forest Service Canada Lynx Conservation Agreements—The Forest Service (Regions 1, 2, 4, 6, and 9) and the Service (Regions 1, 3, 5, and 6) entered into a Canada Lynx Conservation Agreement on February 7, 2000, to promote the conservation of lynx and lynx habitat on lands managed by the Forest Service (U.S. Forest Service and U.S. Fish and Wildlife Service 2000).

The agreement was revised and extended in May 2005 (U.S. Forest Service and U.S. Fish and Wildlife Service 2005). In the revised agreement, one change from the original was that the conservation agreement would apply only to those National Forest lands mapped as "occupied lynx habitat." In May 2006, the revised conservation agreement was amended to include a definition of "occupied lynx habitat" (U.S. Forest Service and U.S. Fish and Wildlife Service 2006).

In 1999, the Deputy Regional Forester, Northern Region, in her capacity as Chair of the National Interagency Lynx Steering Committee, provided the affected Forests with direction and information for proceeding with conferencing (or consultation should the lynx be listed). Each National Forest was advised to begin mapping lynx habitats in coordination with respective Service field offices. Specific tasks outlined in the memorandum included the

preparation of maps of lynx habitat on National Forests and BLM districts, and the delineation of Lynx Analysis Units (LAUs) (as recommended in the then draft LCAS) within mapped lynx habitat.

Lynx habitat maps were developed using the best available information regarding lynx habitat types, as well as the best mapping resources available to the Forest Service at the time. The types of mapping resources and technology available on each Forest varied, and thus the accuracy and precision varied as well. Further examination and refinement of lynx habitat mapping followed. During 1999, interagency meetings were held, including state-specific meetings with local Service, Forest Service and BLM representatives to refine lynx habitat maps and LAU designations. Since then, the Forest Service, aided by the Lynx Biology Team and lynx scientists, has further refined lynx maps through better mapping techniques and ground-truthing at the project level. Thus, we expect that lynx habitat maps and LAUs will be further refined and improved as information becomes available. Between 1999 and 2002, the Forest Service conducted an extensive National Lynx Survey to detect the presence of lynx on National Forests throughout the range of the United States lynx DPS (J. Claar, pers. comm. 2007 *in* NRLA BO).

In 2005, the Service, along with representatives from the Forest Service, completed a Recovery Outline for the Contiguous United States Distinct Population Segment of the Canada Lynx (recovery outline) (U.S. Fish and Wildlife Service 2005). This recovery outline is to serve as an interim strategy to guide recovery efforts until a final recovery plan is completed. The outline identifies core, secondary, and peripheral areas for lynx, and preliminary recovery actions.

The Service completed an earlier biological opinion on September 7, 2007, on Alternative F for the SRLA. The Forest Service never issued a Record of Decision on that proposed action due to changed conditions resulting from a major mountain pine beetle epidemic, as well as clarification on timber management standards. The proposed action was modified and is now represented in Alternative F-Modified and was re-submitted for formal consultation on May 7, 2008. The BA (U.S. Forest Service 2008) provides a comparison of Alternative F and Alternative F-Modified. To summarize, this proposed action now allows for pre-commercial thinning outside the wildland urban interface under specific conditions and provides further clarification on appropriate treatments in multi-story mature or late successional conifer forests. Additional minor changes to the proposed action are also included in Alternative F-Modified. This biological opinion replaces the September 7, 2007 biological opinion.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Action Area

This action area includes seven National Forests within Colorado and southeastern Wyoming, including:

- Arapaho and Roosevelt National Forests;
- Grand Mesa, Uncompahgre and Gunnison National Forests;
- Pike and San Isabel National Forests;
- Medicine Bow and Routt National Forests (operating under two separate Forest Plans);
- Rio Grande National Forest;
- San Juan National Forest; and
- White River National Forest.

The SRLA area encompasses approximately 12,000,000 acres of National Forest System lands, of which 7,577,149 acres of National Forest lands are mapped as lynx habitat.

In 2005 and 2006, the revised Canada Lynx Conservation Agreement (U.S. Forest Service and U.S. Fish and Wildlife Service 2005 and 2006) directed that the agreement would apply only to those National Forest lands mapped as "occupied lynx habitat." The 2006 amended conservation agreement defined occupied lynx habitat as:

> "All lynx habitat on an entire Forest is considered "occupied" by lynx when 1) There are at least two verified lynx observations or records since 1999 on the national forest unless they are verified to be transient individuals; or 2) There is evidence of lynx reproduction on the national forest."

All areas of lynx habitat within the SRLA area are considered occupied, therefore, the amendment will apply to all areas of mapped lynx habitat (i.e., LAUs) and landscape linkages on National Forest lands within the SRLA area.

Proposed Action

The Forest Service proposes to amend the Land and Resource Management Plans on seven National Forests in the SRLA area to incorporate management direction from the LCAS, with modifications and additions based on recent information. The proposed amendments will replace the interim strategy of implementing the eight Forest Plans under the Conservation Agreements (2000, 2005, and 2006). Note that while there are seven National Forests in the SRLA area, a total of eight Land and Resource Management Plans will be

amended since the Routt National Forest and the Medicine Bow National Forest are managed as one Forest although they have separate Land and Resource Management Plans. The proposed amendments were designed to address the significant factor causing the lynx to be listed as a threatened species, which was the lack of Federal land management plan guidance to conserve lynx and the potential for these Plans to allow or direct actions that adversely affect lynx (March 24, 2000; 65 FR 16052). This biological opinion replaces the previous national consultation (U.S. Fish and Wildlife Service 2000) for the Land and Resource Management Plans on seven National Forests in Colorado and southern Wyoming, and supersedes the consultations on the revised Plans for the Medicine Bow National Forest (2003) and White River National Forest (2002) with respect to lynx.

This consultation on the amended Forest Plans represents the first layer of a tiered consultation framework. Subsequent projects that may affect lynx as implemented under the amended Forest Plans will constitute the second tier of consultation. Second tier biological opinions would be issued, as appropriate, where proposed actions would result in adverse effects to lynx. These second tier biological opinions would reference back to this biological opinion to ensure that the effects of specific projects under consultation, taken together with all other second tier projects, are commensurate with the effects anticipated in this biological opinion. With each subsequent second tier biological opinion, the cumulative total of incidental take exempted would be tracked along with all other take that had been exempted.

The Forest Service manages lands in the action area under many programs; however, not all of these programs affect lynx. This biological opinion only addresses forest management programs that have the potential to affect lynx. Forest Service land management has the potential to influence the following factors, or areas of concern, that impact lynx: habitat conversions, vegetation thinning, fire management, landscape patterns, road management, developed recreation, non-winter recreation, winter recreation, minerals and energy development, land adjustments, coordination, and monitoring (Hickenbottom et al. 1999). Thus, the Forest Service proposes to amend existing management Plans by incorporating additional management direction to address these factors to protect lynx where they occur. The amendment affects the following Forest Service programs: vegetation management (i.e., pre-commercial thinning, timber harvest, fuels management, and salvage harvest), Forest roads, livestock grazing, minerals, developed recreation, non-winter dispersed recreation, and winter recreation.

Relationship of Proposed Action to Existing Management

For the past six years, the Forest Service has been managing lands in accordance with the Conservation Agreements (U.S. Forest Service and U.S. Fish and Wildlife Service 2000; U.S. Forest Service and U.S. Fish and Wildlife Service 2005; U.S. Forest Service and U.S. Fish and Wildlife Service 2006), or in accordance with recently-revised Land and Resource Management Plans. According to the Conservation Agreements, most projects with adverse effects on lynx would be deferred until Plans were revised or amended, and the recommendations of the LCAS would be considered when amending Plans. For five of the

National Forests, the Forest Service considered the baseline condition to be management consistent with the Conservation Agreements, while the baseline for two National Forests (Medicine Bow and White River) reflects implementation of the revised Plans (Forest Service 2008).

This amendment would be a change from baseline conditions because it would allow Forest Service actions with adverse effects on lynx to proceed in lynx habitat after appropriate consultation. Specifically, the Forest Service modified several standards in the LCAS to include exemptions and exceptions for some vegetation management. The proposed amendment would allow some adverse effects to lynx primarily from the following types of projects: 1) fuels management projects that are *exempted* from vegetative management standards inside wildland-urban interface (WUI) areas in up to 3 percent of lynx habitat per Forest over a 15-year period; 2) *exceptions* to vegetative standards for some vegetation management that would be conducted for fuels treatment or other resource benefits (e.g., aspen restoration, research, etc.) in up to 0.5 percent of lynx habitat per Forest over a 15-year period, and 3) *exceptions* for vegetation treatments using pre-commercial thinning (PCT) techniques, either inside or outside the WUI, on up to 1 percent of the lynx habitat per LAU over a 15-year period. The proposed action also includes a vegetation standard to maintain multi-storied forested conifer stands, which was not included in the original LCAS.

As part of the proposed action, some LCAS standards were changed to guidelines because the Forest Service considers guidelines more appropriate for those risk factors that the Service determined were not negatively affecting the lynx DPS as a whole (March 24, 2000; 65 FR 16052), and, therefore, the Forest Service determined that the level of constraint [implied by standards] is not warranted. The Service notes that where we determined in our finding that certain risk factors did not negatively affect the lynx DPS, the risks may impart adverse effects to individual lynx depending upon site specific conditions. In some cases, there was a lack of scientific or reliable information to indicate that certain standards were needed to avoid adverse effects to lynx.

Guidelines would be implemented in most Forest actions (Forest Service 2008). The BA (Forest Service 2008) defines a "guideline" as follows: "A guideline is a particular management action that should be used to meet an objective found in a land management plan. The rationale for deviations from guidelines will be documented, but amending the Plan is not required." A standard is defined as follows: "A standard is a required action in a land management plan specifying how to achieve an objective or under what circumstances to refrain from taking action. A plan must be amended to deviate from a standard." Guidelines would be adhered to in most cases, except where compelling reasons are an issue, such as the protection of other species at risk or protection of public safety.

Continuing Role of LCAS

The LCAS will continue to serve as a tool for reference and background information on lynx. The amendment provides objectives, standards, and guidelines that relate to forest

management programs implemented by the Forest Service. The objectives, standards, and guidelines provided in this proposed action replace those in the LCAS, namely the Chapter 7 – Conservation Measures, for forest management actions implemented by the Forest Service within the Southern Rockies. Conservation measures that address activities other than those relating to forest management programs are still considered appropriate and applicable. Other Federal agencies will continue to follow the conservation measures provided in the LCAS.

Elements of the Proposed Action

The following direction, objectives, standards, and guidelines would apply to the areas of seven National Forests that encompass lynx habitat (approximately 7.6 million acres).

Habitat Connectivity. The Forest Service proposes to require all new or expanded permanent developments and vegetation management activities to maintain or enhance habitat connectivity. This direction is designed to enhance the ability of lynx to move freely across the landscape during periods of dispersal or food scarcity and reduce mortality risk associated with highways. The proposed action includes an objective to pursue conservation easements, land exchanges, and other actions to reduce adverse impacts on lynx and lynx habitat within linkage zones (**LINK O1** and **HU O6**). The proposed action includes two standards and two guidelines for managing lands to implement this objective by considering lynx movement within and between blocks of suitable habitat:

- New or expanded permanent developments and vegetation management projects must maintain habitat connectivity in an LAU and/or linkage area (**All S1**).
- When highway or Forest highway construction or reconstruction is proposed in linkage areas, identify potential highway crossings (**LINK S1**).
- National Forest System lands should be retained in public ownership (**LINK G1**).
- Livestock grazing in shrub-steppe habitats should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes (**LINK G2**).

Timber Management. Timber management in the SRLA area includes timber harvest, pre-commercial thinning, commercial thinning, and salvage logging. Within lynx habitat, the Forest Service proposes to limit vegetation management that changes habitat to a "stand initiation structural stage" (described in the LCAS as "lynx habitat in unsuitable condition") to no more than 30 percent of the lynx habitat within an LAU, with the exception of some fuels management projects within the WUI that are exempted from this standard (see details in *Fuels Management* section below).

The Forest Service conducts and/or permits silvicultural thinning to reduce dense horizontal structure and encourage growth of remaining trees. Pre-commercial thinning projects during the stand initiation stage reduce the quality of snowshoe hare habitat and thus reduce prey for

lynx. Within lynx habitat, the Forest Service proposes to allow some limited pre-commercial thinning under specific circumstances (see details in *Fuels Management* section below).

Thinning or reduction of the understory of mature conifer multi-story structural stages would also reduce the quality of snowshoe hare habitat and thus reduce lynx prey and foraging habitat. Within lynx habitat, the Forest Service proposes to minimize projects that reduce snowshoe hare habitat in multi-storied mature or late successional conifer forests that provide snowshoe hare habitat, with some exemptions and exceptions for specific circumstances (see details in *Fuels Management* section below).

The Forest Service proposes to manage vegetation within the SRLA area according to the following standards and guidelines:

- Unless a broad scale assessment has been completed that substantiates different historic levels of stand initiation structural stages, disturbances in each LAU will be limited as follows: if more than 30 percent of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects **(VEG S1).**
- Timber management projects shall not regenerate more than 15 percent of lynx habitat on National Forest System lands in an LAU in a ten-year period. This 15 percent includes the entire stand within an even-age regeneration area, and only the patch opening areas within group selection treatments. Salvage harvest within stands killed by insect epidemics, wildfire, etc. does not add to the 15 percent, unless the harvest treatment would cause currently suitable lynx habitat to change to an unsuitable condition **(VEG S2).** *Note:* The Forest Service defines "regeneration" as cutting trees and creating an entire new age class; an even-age harvest. The major methods are clearcutting, seed tree, and shelterwood cuts (Forest Service 2008).
- Pre-commercial thinning projects that reduce snowshoe hare habitat are subject to the following limitations from the stand initiation structural stage until the stands no longer provide winter snowshoe hare habitat 1) within 200 feet of administrative sites, dwellings, or outbuildings; or 2) for research studies or genetic tree tests evaluating genetically improved reforestation stock; or 3) based on new information that is peer reviewed and accepted by the regional/state levels of the Forest Service and FWS, where a written determination states: a) that a project is not likely to adversely affect lynx; or b) that a project is likely to have short term adverse effects on lynx or its habitat, but would result in long-term benefits to lynx and its habitat; or 4) for conifer removal in aspen, or daylight thinning around individual aspen trees, where aspen is in decline; or 5) in addition to the above exceptions (and above and beyond the three percent limitations for fuels projects with the WUI), pre-commercial thinning may occur provided that: a) the additional thinning does not exceed one percent of the lynx habitat in any LAU for the life of the amendment, b) pre-commercial thinning in LAUs with more than 30 percent in the stand initiation structural stage is limited to areas that do not yet provide winter snowshoe hare habitat, c) projects are designed to maintain lynx habitat connectivity and hare habitat

over the long term, and d) monitoring is used to determine snowshoe hare response **(VEG S5)**. This exception for pre-commercial thinning in 1 percent of lynx habitat per LAU may occur either within or outside the WUI.

- Vegetation management projects that reduce snowshoe hare winter habitat in multi-story mature or late successional conifer forests may occur only under the following *exceptions*: 1) within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special use permit improvements, including infrastructure within permitted ski area boundaries; or 2) for research studies or genetic tree tests evaluating genetically improved reforestation stock; or 3) for incidental removal during salvage harvest (e.g., removal due to location of skid trails); or 4) where uneven-aged management (single tree and small group selection) practices are employed to maintain and encourage multi-story attributes (i.e., horizontal cover) as part of gap dynamics. Project design must be consistent with **VEG 01, 02, and 04**, except where impacts to areas of dense horizontal cover are incidental to activities under this exemption (e.g., construction of skid trails) **(VEG S6)**.
- Vegetation management projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Priority should be given to stem-exclusion, closed-canopy structural stage stands for lynx or their prey (e.g., mesic, monotypic lodgepole stands). Winter snowshoe hare habitat should be near denning habitat **(VEG G1)**.
- Habitat for alternate prey species, primarily red squirrel, should be provided in each LAU **(VEG G5)**.
- Denning habitat should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future **(VEG G11).**

Fuels Management.. Fire management includes mechanical treatment of fuels, wildland fire use, and prescribed fire. It is generally acknowledged that fire suppression in the Southern Rocky Mountains has altered historic vegetative patterns. This effect has been most pronounced within vegetation communities that have fire regimes that are of low intensity or of mixed severity. Many of these are drier community types and are not considered lynx habitat. Spruce-fir habitats (lynx habitat) appear to have been little or less affected by fire suppression because the fire regimes within this type tend to be stand replacing events occurring at low frequencies (i.e., every 100 years or more) (Agee 2000). Depending on the moisture regime, large stand-replacing fires within lynx habitat may produce dense regenerating growth, providing high quality snowshoe hare foraging habitat after approximately 10 to 30 years. While this vegetative condition provides high quality snowshoe hare habitat, mature forests also are very important as winter foraging habitat (J. Squires, U.S.D.A. Forest Service, Rocky Mountain Research Station, pers. comm. 2005 *in* NRLA BO; McKelvey et al. 2000d).

The Forest Service has been giving increased attention to fuels management within the Wildland Urban Interface (WUI), as directed by the Healthy Forest Restoration Act (HFRA). The area encompassed by the WUI is identified in a community wildfire protection plan (CWPP). If there is no CWPP in place, the WUI is identified as: 1) the area 0.5 miles from the boundary of an at-risk community; 2) within 1.5 miles of the boundary of an at-risk community if the terrain is steep or there is a nearby road or ridge top that could be incorporated into a fuel break or the land is in condition class 3; or 3) the area contains an emergency exit route that requires hazardous fuel reductions to provide safer evacuation from the at-risk community (U.S. Forest Service 2008). At-risk communities are defined in HFRA as: A) i – an interface community identified in 66 Fed Reg 753, January 4, 2001, or ii) a group of homes with basic infrastructure and services [such as utilities and collectively maintained transportation routes] within or adjacent to Federal lands; B) in which conditions are conducive to a large scale fire event; and C) for which there is a significant threat to human life or property.

The following language applies to these standards to limit the acreage treated for fuels management:

- The cumulative total of fuel treatment projects within the WUI that do not meet the vegetation standards **VEG S1, S2, S5, or S6** shall not exceed 3 percent of mapped lynx habitat per Forest (administrative unit) in the SRLA area.
- Fuel treatment projects in the WUI, as defined in HFRA, should be designed considering standards **VEG S1, S2, S5, and S6** to promote lynx conservation (**VEG G10**).
- Fuel treatment projects may not result in more than 3 adjacent LAUs exceeding the **VEG S1** standard.

This 3 percent limit on reducing lynx habitat from fuels treatment projects in the WUI was derived by the Forest Service by approximating the percent of mapped lynx habitat that falls within the cumulative area of the WUIs within the SRLA area (generally extending an average of 1 mile from a community at risk). Approximately 265,437 acres of lynx habitat were identified within the WUI areas in the SRLA area; this value represents 3.5 percent of the lynx habitat within the SRLA area. The Forest Service decided to limit the exemptions to **VEG S1, S2, S5, or S6** to a total of 3 percent of the lynx habitat within the SRLA area, which is approximately 227,315 acres. In order to meet the goals of community protection in the HFRA, the Forest Service is assuming that almost the entire 1 mile (average) WUI could be treated under the amendment. However, the need to treat the entire area within the WUI, as well as obtaining the funding necessary to do so, is unlikely (U.S. Forest Service 2008). "Treatments" include all management activities that could be used to conduct fuels management, including prescribed fire, wildland fire use, thinning, timber, and salvage harvest.

Additionally, the Forest Service proposes to apply the following guidelines to further minimize the effects of the proposed action on lynx:

- Prescribed fire activities should not create permanent travel routes that facilitate snow compaction. Construction of permanent firebreaks on ridges or saddles should be avoided (**VEG G4**).

Roads and Highways. The Service's final rule listing the lynx determined that Forest roads were not known to negatively impact resident lynx populations (March 24, 2000; 65 FR 160052). However, in the Southern Rockies, high volume highways have resulted in eleven known mortalities since 1999 (Shenk 2006). The proposed action includes the following guidelines that would reduce the potential effects of Forest roads and highways on lynx and lynx habitat:

- Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or Forest highways across Federal land. Methods could include fencing, underpasses or overpasses (**ALL G1**).
- Methods to avoid or reduce effects to lynx habitat connectivity should be used when upgrading unpaved roads to maintenance levels 4 or 5, where the result would be increased traffic speeds and volumes, or contribute to development or increases in human activity (**HU G6**). Maintenance level 4 roads typically contain double lanes and an aggregate surface. Maintenance level 5 roads are typically double-lane and paved, although some may have an aggregate surface with dust abatement treatments.
- New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity. New permanent roads and trails should be situated away from forested stringers (**HU G7**).
- Cutting brush along low-speed, low-traffic-volume roads should be done to the minimum level necessary to provide for public safety (**HU G8**).
- If project level analysis determines that new roads adversely affect lynx, then public motorized use should be restricted. Upon project completion, these roads should be reclaimed or decommissioned, if not needed for other management objectives (**HU G9**).
- Winter access for non-recreational special uses and mineral and energy exploration and development should be limited to designated routes or designated over-the-snow routes (**HU G12**).
- When highway or Forest highway construction or reconstruction is proposed in linkage areas, potential highway crossings will be identified (**LINK S1**).

Recreation. The Forest Service proposes to implement the following guidelines to minimize the potential effects of the proposed action on lynx and lynx habitat:

- Developed Recreation:
  - When developing or expanding ski areas, provisions should be made for adequately sized inter-trail islands that include coarse woody debris, so lynx foraging habitat is maintained (**HU G1**).
  - When developing or expanding ski areas, lynx foraging habitat should be provided consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands of coniferous forest across mountain slopes (**HU G2**).

- Recreation developments and operations should be planned in ways that both provide for lynx movement and maintain the effectiveness of lynx habitat (**HU G3**).
- When developing or expanding ski areas and trails, consider locating access roads and lift termini to maintain and provide lynx security habitat (**HU G11**).

- Winter Dispersed Recreation: The Service's final rule listing the lynx determined there was no evidence that competition from coyotes, bobcats, or mountain lions, as facilitated by compacted snow trails, was negatively affecting lynx at a population-level scale (March 24, 2000; 65 FR 16052).
  - Designated over-the-snow routes, or designated play areas should not expand outside baseline areas of consistent snow compaction, unless designation serves to consolidate use and improve lynx habitat. This may be calculated on an LAU basis, or on a combination of immediately adjacent LAUs. This guideline does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by guideline HU G12 (**HU G10**).

Minerals and Energy Development. We found no evidence that mineral development was a factor threatening lynx, therefore, we did not address mineral development in the final listing rule (March 24, 2000; 65 FR 16052). However, to reduce impacts to individual lynx, the proposed action contains the following guidelines designed to minimize the impacts of minerals-related activities on lynx and lynx habitat:

- For mineral and energy development sites and facilities, remote monitoring should be encouraged to reduce snow compaction (**HU G4**).
- A reclamation plan should be developed (e.g., road reclamation and vegetation rehabilitation) that promotes the restoration of lynx habitat for completed mineral and energy development sites and facilities (**HU G5**).
- Methods to avoid or reduce effects to lynx should be used in lynx habitat when upgrading unpaved roads to maintenance levels 4 or 5, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development (**HU G6**).
- If project level analysis determines that new roads adversely affect lynx, then public motorized use should be restricted. Upon project completion, these roads should be reclaimed or decommissioned, if not needed for other management objectives (**HU G9**).
- Winter access for non-recreation special uses, and mineral and energy exploration and development, should be limited to designated routes or designated over-the-snow routes (**HU G12**).

Grazing. Because the Plan amendments are designed to incorporate only new management direction, management direction contained in the LCAS that was redundant with existing management direction is not part of this amendment. Further, measures contained in other

Plan direction or agreements that have riparian management strategies may also provide benefits to lynx.

We found no evidence that grazing was a factor threatening lynx, therefore, grazing was not addressed in the final listing rule (March 24, 2000; 65 FR 16052). The proposed action includes four guidelines for grazing management practices that provide for the management of trees, shrubs, and aspen clones in lynx habitat. These guidelines are:

- In fire- and harvest-created openings, livestock grazing should be managed so impacts do not prevent shrubs and trees from regenerating (**GRAZ G1**).
- In aspen stands, livestock grazing should be managed to contribute to the long-term health and sustainability of aspen (**GRAZ G2**).
- In riparian areas and willow carrs, livestock grazing should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes (**GRAZ G3**).
- In shrub-steppe habitats, livestock grazing should be managed in the elevation ranges of forested lynx habitat in LAUs, to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes (**GRAZ G4**).
- In linkage areas, livestock grazing in shrub-steppe habitats should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes (**LINK G2**).

STATUS OF THE SPECIES

The lynx was added to the list of threatened species on March 24, 2000 (65 FR 16052). We concluded that the single factor threatening the contiguous United States DPS of lynx was the inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of lynx in National Forest Land and Resource Management Plans and BLM Land Use Plans. On July 3, 2003, we published a clarification of findings published in the Federal Register (68 FR 40076) determining that threatened species designation was appropriate for the lynx. We published a final rule to designate critical habitat for the Canada lynx in the contiguous United States on November 9, 2006 (71 FR 66007); the critical habitat designation did not include the SRLA area. Most recently, we published a proposed rule to revise critical habitat for the Canada lynx on February 28, 2008 (73 FR 10860); critical habitat was not proposed in the SRLA area. Therefore, this biological opinion will not analyze effects to critical habitat as none will be affected. The Service's various listing rules provide a good resource for a more thorough discussion of life history information on lynx that is summarized below.

Species Description

The lynx is a medium-sized cat with long legs; large, well-furred paws; long tufts on the ears; and a short, black-tipped tail (McCord and Cardoza 1982). The winter pelage of the lynx is

dense and has a grizzled appearance with grayish-brown mixed with buff or pale brown fur on the back, and grayish-white or buff-white fur on the belly, legs, and feet. Summer pelage of the lynx is more reddish to gray-brown (Koehler and Aubry 1994). Adult males average 22 pounds in weight and 33.5 inches in length (head to tail), and females average 19 pounds and 32 inches (Quinn and Parker 1987). The lynx's long legs and large feet make it highly adapted for hunting in deep snow.

Home Range and Dispersal

Individual lynx maintain large home ranges reported as generally ranging between 12 to 83 square miles (Koehler 1990; Aubry et al. 2000; Squires and Laurion 2000; Squires et al. 2004; Vashon et al. 2005a). The size of lynx home ranges varies depending on abundance of prey, the animal's gender and age, season, and the density of lynx populations (Koehler 1990; Poole 1994; Slough and Mowat 1996; Aubry et al. 2000; Mowat et al. 2000; Vashon et al. 2005a). When densities of snowshoe hares decline, for example, lynx enlarge their home ranges to obtain sufficient amounts of food to survive and reproduce. Preliminary research supports the hypothesis that lynx home ranges at the southern extent of the species' range are generally large compared to those in the core of the range in Canada (Koehler and Aubry 1994; Apps 2000; Squires and Laurion 2000). In the Southern Rockies, lynx home ranges include 15 to 50 square miles (Reudiger et al. 2000).

The primary factor driving lynx behavior and distribution is the distribution of snowshoe hare, their primary prey. Lynx are highly mobile and have a propensity to disperse long distances, particularly when prey becomes scarce (Mowat et al. 2000). Cover is important to lynx when searching for food (Brand et al. 1976). Lynx have been observed (via snow tracking) to avoid large openings (Koehler 1990; Staples 1995) during daily movements within the home range, seeming to prefer to move through continuous forest, using the highest terrain available such as ridges and saddles (Koehler 1990; Staples 1995). Lynx often hunt along edges (Mowat et al. 2000). Kesterson (1988) and Staples (1995) reported that lynx hunted along the edges of mature stands within a burned forest matrix, and Major (1989) found that lynx hunted along the edge of dense riparian willow stands. In Montana, lynx preferentially foraged in spruce-fir forests with high horizontal cover, abundant hares, and large diameter trees during the winter (Squires et al. 2006). Lynx tended to avoid sparse, open forest and forest stands dominated by small-diameter trees during the winter.

Lynx also make long distance exploratory movements outside their home ranges (Aubry et al. 2000; Moen et al. 2004). Areas or habitats used by lynx during dispersal or exploratory movements are poorly understood at this time. Evidently, lynx are able to traverse expanses of diverse habitat types and conditions during their movements. Dispersing lynx may colonize suitable but unoccupied habitats, augment existing resident populations, or disperse to unsuitable or marginal habitats where they cannot survive. Lynx are capable of dispersing extremely long distances (Mech 1977; Washington Department of Wildlife 1993); for example, a male was documented traveling 370 miles (Brainerd 1985). Lynx disperse primarily when snowshoe hare (*Lepus americanus*) populations decline (Ward and Krebs

1985; Koehler and Aubry 1994; O'Donoghue et al. 1997; Poole 1997). Subadult lynx disperse even when prey is abundant (Poole 1997), presumably as an innate response to establish home ranges. During the early 1960's and 1970's, numerous lynx were documented in atypical habitat, such as in North Dakota. In those years, harvest returns indicated unprecedented cyclic lynx highs for the 20th century in Canada (Adams 1963; Harger 1965; Mech 1973; Gunderson 1978; Thiel 1987; McKelvey et al. 2000b). Many of these unusual observations were probably dispersing animals that either were lost from the population or later returned to suitable habitat.

Diet

Snowshoe hares are the primary prey of lynx, comprising 35 to 97 percent of the diet throughout the range of the lynx (Koehler and Aubry 1994). Other prey species include red squirrel (*Tamiasciurus hudsonicus*), grouse (*Bonasa umbellus*, *Dendragopus* spp., *Lagopus* spp.), flying squirrel (*Glaucomys sabrinus*), ground squirrel (*Spermophilus parryii*, *S. Richardsonii*), porcupine (*Erethrizon dorsatum*), beaver (*Castor canadensis*), mice (*Peromyscus* spp.), voles (*Microtus* spp.), shrews (*Sorex* spp.), fish, and ungulates as carrion or occasionally as prey (Saunders 1963; van Zyll de Jong 1966; Nellis et al. 1972; Brand et al. 1976; Brand and Keith 1979; Koehler 1990; Staples 1995; O'Donoghue et al. 1998a). The primary winter prey species of lynx in Colorado are snowshoe hare and red squirrel, with other mammals and birds forming a minor part of the winter diet (Shenk 2004). Winter food items in Montana included snowshoe hare (96 percent), red squirrel, and grouse (Squires and Ruggiero 2007).

During the cycle when hares become scarce, the proportion and importance of other prey species, especially red squirrel, increases in the diet (Brand et al. 1976; O'Donoghue et al. 1998a; Apps 2000; Mowat et al. 2000). However, a diet of red squirrels alone might not be adequate to ensure lynx reproduction and survival of kittens (Koehler 1990). In northern regions, when hare densities decline, the lower quality diet causes sudden decreases in the productivity of adult female lynx and decreased survival of kittens, which causes the numbers of breeding lynx to level off or decrease (Nellis et al. 1972; Brand et al. 1976; Brand and Keith 1979; Poole 1994; Slough and Mowat 1996; O'Donoghue et al. 1997). Relative densities of snowshoe hares at southern latitudes are generally lower than those in the north, and differing interpretations of the population dynamics of southern populations of snowshoe hare have been proposed (Hodges 2000b).

Snowshoe hares have evolved to survive in areas that receive deep snow (Bittner and Rongstad 1982). Primary forest types that support snowshoe hare are subalpine fir, Engelmann spruce, Douglas-fir, and lodgepole pine in the western United States, and spruce/fir, pine, and deciduous forests in the eastern United States (Hodges 2000b). Snowshoe hares prefer boreal forest stands that have a dense horizontal understory to provide food, cover and security from predators (Wolfe et al. 1982; Monthey 1986; Koehler and Aubrey 1994). Snowshoe hares feed on conifers, deciduous trees and shrubs (Hodges 2000b). Snowshoe hare density is correlated to understory (horizontal) cover between

approximately 3 to 10 feet above the ground or snow level (Hodges 2000b). Generally, earlier successional forest stages support a greater density of horizontal understory and more abundant snowshoe hares (Buehler and Keith 1982; Wolfe et al. 1982; Koehler 1990; Hodges 2000b; Homyack 2003; Griffin 2004). Mature, multistoried stands also can have adequate dense understory to support abundant snowshoe hares (Hodges 2000a; Hodges 2000b; Griffin 2004, Squires et al. 2006).

Most research has focused on the winter diet. Summer diets are poorly understood throughout the range of lynx. Mowat et al. (2000) reported through their review of the literature that summer diets have less snowshoe hare and more alternate prey species, possibly because of a greater availability of other species. In summer, lynx broaden their habitat use from older, multi-storied forest stands to include younger forest stands with an abundance of shrub cover (Squires et al. 2006). The researchers assumed "this shift in habitat use [by lynx] during summer is due to hares being abundant in young forest stands with deciduous vegetation providing high horizontal cover." Mature forests also provide snowshoe hare habitat as openings are created in the canopy when trees succumb to disease, fire, wind, ice, or insects, and the understory develops (Squires et al. 2006).

Den Site Selection

Lynx use a variety of types of large woody debris, such as downed logs, root wads, and windfalls, to provide denning sites with security and thermal cover for kittens (McCord and Cardoza 1982; Koehler 1990; Koehler and Brittell 1990; Mowat et al. 2000; Squires and Laurion 2000; Squires et al. 2006; Merrill and Schenk 2006). During the first few months of life, kittens are left alone at these sites when the female lynx hunts. Downed logs and overhead cover provide protection of kittens from predators, such as owls, hawks, and other carnivores during this period. Denning habitat that is in or near foraging habitat is likely to be most functional. The hunting range of females is restricted at the time of parturition, and their need to feed kittens requires an abundance of prey. Lynx, like other felids, frequently move their kittens until they are old enough to hunt with their mother. Multiple nursery sites are used that provide kittens with overhead cover and protection from predators and the elements.

The age of the forest stand does not seem as important for denning habitat as the amount of horizontal structure available, e.g., downed, woody debris (Mowat et al. 2000), which provides hiding cover and shelter for kittens. Den sites may be located within older regenerating stands (>20 years since disturbance) or in mature conifer or mixed conifer-deciduous (typically spruce/fir or spruce/birch) forests. Tip-up mounds (root wads) were the most common predictor of den sites (M. McCullough, pers. comm. 2007 *in* NRLA BA). In Montana, lynx selected den sites with higher horizontal cover than elsewhere in the animal's home range (Squires et al. 2006). Seventy-three percent of lynx dens were found in mature, mesic forests. Dens were also located in regenerating mesic forests (18 percent) and boulder fields (7 percent). In Washington, lynx used *Pinus contorta* (lodgepole pine), *Picea* spp. (spruce), and *Abies lasiocarpa* (subalpine fir) forests older than 200 years with an abundance

of downed woody debris for denning (Koehler 1990). A den site in Wyoming was located in a mature subalpine fir/ lodgepole pine forest with abundant downed logs and a high amount of horizontal cover (Squires and Laurion 2000). Den sites in Colorado were located on steep slopes (mean 30 degree slope) at high elevations (ranging between 10,226 and 11,765 feet) with a dense understory of coarse woody debris (Merrill and Shenk 2006).

Recruitment

Breeding occurs through March and April in the north (Quinn and Parker 1987). Kittens are born in May to June in southcentral Yukon (Slough and Mowat 1996). The male lynx does not help with rearing young (Eisenberg 1986). Slough and Mowat (1996) reported yearling females giving birth during periods when hares were abundant; male lynx may be incapable of breeding during their first year (McCord and Cardoza 1982).

In northern study areas during the low phase of the hare cycle, few if any live kittens are born, and few yearling females conceive (Brand and Keith 1979; Poole 1994; Slough and Mowat 1996). However, Mowat et al. (2000) suggested that in the far north, some lynx recruitment occurs when hares are scarce and this may be important in lynx population maintenance during hare lows.

During periods of hare abundance in the northern taiga, litter size of adult females averages four to five kittens (Mowat et al. 1996). In Montana, the average litter size in the Seeley Lake study area was 2.3 kittens, and 3.2 kittens in the Purcell Mountains (Squires et al. 2006). Koehler (1990) suggested that the low number of kittens produced in northcentral Washington was comparable to northern populations during periods of low snowshoe hare abundance. In his study area, two radio-collared females had litters of three and four kittens in 1986, and one kitten in 1987 (the actual litter size of one of the females in 1987 was not determined) (Koehler 1990). In Wyoming, one female produced four kittens in 1998 and the same female produced two kittens in 1999 (Squires and Laurion 2000). In Colorado, Shenk (2006) reported that the mean number of kittens born per litter was 2.78 during the period from 2003 to 2006.

Habitat Connectivity

It is suggested in the Ecology and Conservation of Canada Lynx (Ruggiero et al. 2000) that lynx in the contiguous United States may exist as several smaller, but effectively isolated metapopulations. An example of this is the boreal forests in Colorado and Utah that are separated from the larger areas of boreal forest in northern Wyoming by at least 100 kilometers. Metapopulation stability depends not only on habitat quality, but also on successful dispersal between isolated habitat patches. The likelihood of subpopulation persistence declines with increasing fragmentation and isolation. That does not mean that more isolated, and therefore more vulnerable, subpopulations are unimportant. In addition, these subpopulations may contain valuable genetic, physiological or behavioral adaptations that allow them to persist (Hickenbottom et al. 1999). Lynx and snowshoe hare habitats are

more prone to a metapopulation structure in the western forests due to fragmented landscapes and heterogeneous distribution of topographic, climatic, and vegetative conditions. This condition is further exacerbated by the presumably greater human caused fragmentation of lynx habitat in the south (Buskirk et al. 2000).

Ruggiero et al. (2000) indicates that we know little about the degree of connectivity or its role in the viability of lynx, but assumes that connectivity plays an important role. Protecting, maintaining, and improving lynx habitat afforded by the various conservation measures contribute to the conservation of lynx and population viability. Maintaining habitats to provide for dispersal movements and interchange among individuals and subpopulations may be the most important provision for maintenance of population viability contained in the LCAS. An interconnected ecosystem can be essential to maintain the ability of subpopulations to expand and colonize new habitats, to recolonize areas where subpopulations have been locally extirpated, to provide population support to declining populations, to allow individuals to find mates among neighboring subpopulations, and to effect dispersal and genetic interchanges (Noss and Cooperrider 1994).

Highways and their continued expansion into mountain towns and resorts increase the amount of fragmentation occurring in these long, linear landscapes. This fragmentation effect further erodes the potential for lynx to effectively cross some of these potential barriers (Ruediger et al. 2000). High-speed, high-volume highways can result in lynx road-kills, fragment and restrict lynx habitat use, impair home range effectiveness, inhibit local and dispersing movements that may lead to reduced habitat connectivity, and the decline of some wildlife populations and species over time due to genetic isolation (Forman and Alexander 1998, Service 2000; Alexander et al. 2004; Clevenger et al. 2002; Forman et. al. 2003). When traffic volume increases, highways often evolve from gravel roads to paved two lane roads, and from two lane highways to more problematic four lane highways, and the interstate highways, which have the most adverse effects to wildlife movements. The result of this progression of upgrades in the transportation system is the mortality of individuals attempting to cross the highway and potential sub-population isolation, both of which result in a slow decline in the population and ultimately can affect viability for some of the low-density carnivores such as lynx and wolverine (Ruediger et al. 2000). Critical points in development of highways occur when gravel forest or backcountry roads are paved, which results in higher speeds, higher traffic volumes and increased human developments.

The Service (2000) found that lynx are impacted by high traffic volume on roads that bisect suitable lynx habitat and by associated suburban developments. The finding determined that the impact of high traffic volume was low <u>except</u> in the Southern Rockies Ecosystem. With respect to highway traffic volumes and wildlife impacts, Canadian studies suggest that 2,000-3,000 vehicles per day (VPD) are problematic and $\geq$ 4,000 VPD are more serious threats to mortality and habitat fragmentation (Ruediger et al. 2000). These conclusions were based upon the general observations and professional judgment of Clevenger (Parks Canada) and Alexander (Univ. Calgary; Nov. 15, 2004, pers. comm., T. Clevenger, Parks Canada, cited in Ruediger et al. 2000), who have conducted some of the most thorough studies (e.g., Clevenger

et al. 2002, Alexander et al. 2004, 2005) of wildlife highway mortality and mitigation in North America. Alexander et al. (2005) concluded that movement was impaired for carnivores, including lynx, when traffic ranged from 300-500 VPD (winter traffic counts). However, the traffic data appear to be estimates of average annual daily traffic (AADT) for the road sections in their study, where year-long AADT may be 3000-5000 VPD AADT (assumes a ratio of 10:1 – AADT: winter traffic counts, as discussed in the study). Also, the Alexander et al. (2005) study measured carnivores in general and was not specific to lynx.

Mortality

Reported causes of lynx mortality vary between studies. The most commonly reported causes include starvation of kittens (Quinn and Parker 1987; Koehler 1990), and human-caused mortality. Significant lynx mortality due to starvation has been demonstrated in cyclic populations of the northern taiga, during the first 2 years of hare scarcity (Poole 1994; Slough and Mowat 1996). Various studies have shown that, during periods of low snowshoe hare numbers, starvation can account for up to two-thirds of all natural lynx deaths. Trapping mortality may be additive rather than compensatory during the low period of the snowshoe hare cycle (Brand and Keith 1979). Hunger-related stress, which induces dispersal, may increase the exposure of lynx to other forms of mortality such as trapping and highway collisions (Brand and Keith 1979; Carbyn and Patriquin 1983; Ward and Krebs 1985; Bailey et al. 1986).

Paved roads have been a mortality factor in lynx translocation efforts within historical lynx range. In New York, 18 translocated lynx were killed on highways (Brocke et al. 1990). Translocated animals may be more vulnerable to highway mortality than resident lynx (Brocke et al. 1990). Eleven lynx have been killed on 2- and 4-lane Colorado highways following their release as part of a reintroduction effort (K. Broderdorp, pers. comm. 2007). Twelve resident lynx were documented being killed on highways in Canada and Alaska (Staples 1995; Gibeau and Heur 1996; T. Clevenger, pers. comm. 1999 *in* NRLA BO; Alexander, pers. comm. 1999 *in* NRLA BO). Lynx were killed on graveled, high-speed Forest roads in flatter terrain in Maine (Mark McCollough, U.S. Fish and Wildlife Service, pers. comm. 2006 *in* NRLA BO).

Predation on lynx by mountain lion, coyote (*Canis latrans*), wolverine (*Gulo gulo*), gray wolf (*Canis lupus*), and other lynx has been confirmed (Berrie 1974; Koehler et al. 1979; Poole 1994; Slough and Mowat 1996; O'Donoghue et al. 1997; Apps 2000; Squires and Laurion 2000; Squires et al. 2006). Squires et al. (2006) reported 15 lynx mortalities in their Montana study area, greater than 90 percent of which were due to mountain lion predation. Observations of such events are rare, and the significance of predation on lynx populations is unknown.

Interspecific Relationships with Other Carnivores

The two major competition impacts to lynx are likely exploitation (competition for food) and interference (avoidance). Several predators (birds of prey, coyote, gray wolf, mountain lion, bobcat, and wolverine) consume snowshoe hares and therefore compete at some level with lynx for prey. Lynx have adaptations for surviving in areas that have cold winters with deep, soft snow for extended periods; these adaptations provide lynx a competitive advantage in hunting snowshoe hare over a number of potential competitors, such as bobcats (*Lynx rufus*) or coyotes (*Canis latrans*) (McCord and Cardoza 1982; Buskirk et al. 2000; Ruediger et al. 2000; Ruggiero et al. 2000). In one paper, coyotes were theorized to most likely pose local or regionally important exploitation impacts to lynx, and coyotes and bobcats were deemed to possibly impart important interference competition effects on lynx (Buskirk et al. 2000). Mountain lions were described as interference competitors, possibly impacting lynx during summer and in areas lacking deep snow in winter, or when high elevation snow packs develop crust in the spring. Long-term snow conditions presumably limit the winter distribution of potential lynx competitors such as bobcats (McCord and Cardoza 1982) or coyotes. Further, bobcats and coyotes have a higher foot load (more weight per surface area of foot), which causes them to sink into the snow more than lynx. Therefore, bobcats and coyotes cannot efficiently hunt in soft or deep snow and are at a competitive disadvantage to lynx.

Exploitation competition may contribute to lynx starvation and reduced recruitment. During periods of low snowshoe hare numbers, starvation accounted for up to two-thirds of all natural lynx deaths in the Northwest Territories of Canada (Poole 1994). As described previously, major predators of snowshoe hare include lynx, northern goshawk, great horned owl, bobcat, coyote, red fox, fisher, and mountain lion. In southern portions of snowshoe hare range, predators may limit hare populations to lower densities than in the taiga (Dolbeer and Clark 1975; Wolff 1980; Koehler and Aubry 1994).

Based on only anecdotal evidence, Parker et al. (1983) discussed competition between bobcats and lynx on Cape Breton Island. Lynx were found to be common over much of the island prior to bobcat colonization. Concurrent with the colonization of the island by bobcats, lynx densities declined and their presence on the island became restricted to the highlands, the one area where bobcats did not become established.

Population Dynamics

Lynx populations in the contiguous United States occur at the southern periphery of a widely-distributed metapopulation whose core is located in the northern boreal forest of central Canada (McCord and Cardoza 1982; Quinn and Parker 1987; McKelvey et al 2000a). The boreal forest of central Canada is vast and extends into Alaska. Lynx in the contiguous United States are at the southern margins, or periphery, of its range. Here, the southernmost extent of the boreal forest that supports lynx occurs in the in the Northeast, western Great Lakes, northern and southern Rockies, and northern Cascades (Ruediger et al. 2000).

The center of North American lynx range is in north-central Canada. Lynx occur in mesic coniferous forests that have cold, snowy winters and provide a prey base of snowshoe hare (Ruggiero et al. 2000). These forests are generally described as boreal forests. Boreal forests provide optimal habitat for snowshoe hares. In North America, the distribution of lynx is nearly coincident with that of snowshoe hares (Bittner and Rongstad 1982; McCord and Cardoza 1982). Lynx survivorship, productivity and population dynamics are closely related to snowshoe hare density in all parts of its range. In the extensive boreal forests of Canada, snowshoe hares reach peak densities of roughly four to six hares per hectare (or 1.6 to 2.4 per acre) and decline to about 0.1 to 1 per hectare (0.04 to 0.4 per acre) during cyclic lows (Krebs et al. 1995, Slough and Mowat 1996, Hodges 2000a). A minimum density of snowshoe hares (greater than 0.5 hares per hectare or 1.2 hares per acre) (Ruggiero et al. 2000) distributed across a large landscape is necessary to support survival of lynx kittens and recruitment into and maintenance of a lynx population.

In Canada and Alaska, lynx populations undergo extreme fluctuations in response to the cycling of snowshoe hare, enlarging or dispersing from their home ranges and ceasing the recruitment of young into the population after hare populations decline (Mowat et al. 2000). However, in the contiguous United States, the boreal forest transitions into other vegetation communities and becomes more patchily distributed. As a result, the southern boreal forests generally support lower snowshoe hare densities, hare populations do not appear to be as highly cyclic as snowshoe hares further north, and lynx densities are lower compared to the northern boreal forest. Although snowshoe hare populations in the southern portion of the range (i.e., in the contiguous United States) may fluctuate, they do not show strong, regular population cycles as in the north (Hodges 2000a). In the contiguous United States, the degree to which regional local lynx population fluctuations are influenced by local snowshoe hare population dynamics is unclear.

In the contiguous United States, the boreal forest transitions into other vegetation communities and becomes more naturally patchily distributed (fragmented) and provides much less productive hare habitat. Thus, lynx populations here are naturally limited by the low availability of snowshoe hares, as suggested by large home range size, high kitten mortality due to starvation, and greater reliance on alternate prey. These characteristics appear to be similar to those exhibited by lynx populations in Canada and Alaska during the low phase of the population cycle (Quinn and Parker 1987, Koehler 1990, Aubry et al. 2000). This similarity to the lynx populations in Canada and Alaska during the low phase is likely due to the inherently patchy distribution of lynx and hare habitat in the contiguous United States and correspondingly lower densities of hares.

Lynx population dynamics may emanate from the core in Canada to the southern periphery in the contiguous United States, as evidenced by a lagged correlation of lynx trap records and observations in the United States (related to cyclic highs in lynx populations in Canada) (McKelvey et al. 2000b; Mowat et al. 2000). In Canada, the Hudson Bay Company maintained fairly accurate annual lynx pelt data across the range of lynx, which reflect dramatic population cycles. In the Great Lakes Geographic Area, population dynamics in

recent decades appear to be strongly driven by immigration from Canada (McKelvey et al. 2000b). However, in other areas and time periods it is not known to what extent the correlation is due to immigration from Canada, population responses to the same factors controlling northern populations, or a combination of the two.

A lack of accurate historic data limits our understanding of lynx population dynamics in the contiguous United States and precludes drawing definitive conclusions about lynx population trends. Historically, formal surveys designed specifically to detect lynx were rarely conducted. Many reports of lynx (e.g., visual observations, snow tracks) have been collected incidentally to other activities, but cannot be used to infer population trends. Long-term trapping data have been used to estimate population trends for various species. In the United States however, trapping returns are strongly influenced by trapper effort, which varies between years and, therefore, may not accurately reflect population trends. Another important problem to note is that trapping records of many States did not differentiate between bobcats and lynx, referring to both as "lynxcats." Overall, the available data are too incomplete to infer much beyond simple occurrence and distribution of lynx in the contiguous United States (McKelvey et al. 2000b).

Lynx are highly mobile and have a propensity to disperse long distances, particularly when prey becomes scarce (Mowat et al. 2000). Lynx also make long distance exploratory movements outside their home ranges (Aubry et al. 2000; Moen et al. 2004). Areas or habitats used by lynx during dispersal or exploratory movements are poorly understood at this time. Dispersing lynx may colonize suitable but unoccupied habitats, augment existing resident populations, or disperse to unsuitable or marginal habitats where they cannot survive. Numerous lynx mortality records exist from anomalous habitats or habitats where no records support evidence (either current or historical) of a reproducing population (McKelvey et al. 2000a). Many of these records correspond to post-population peaks in Canada, with some lag time for immigration (McKelvey et al. 2000a). We find no evidence of lynx populations becoming established in such areas.

We suspect that some areas in the contiguous United States naturally act as "sources" of lynx (recruitment is greater than mortality) that are able to disperse and potentially colonize other patches (McKelvey et al. 2000a). Other areas may function as "sinks" (mortality is greater than recruitment) where lynx are lost from the overall population. Sink habitats are most likely those places on the periphery of the southern boreal forest where habitat becomes more fragmented and more distant from larger lynx populations. Fluctuations in prey populations may cause some habitat patches to change from being sinks to sources, and vice versa. The ability of naturally dynamic habitat to support lynx populations may change as the habitat undergoes natural succession following natural or manmade disturbances (i.e., fire, insects, clearcutting).

Individual lynx maintain large home ranges (reported as generally ranging between 31 to 216 km^2 [12 to 83 mi^2]) (Koehler 1990; Aubry et al. 2000; Squires and Laurion 2000; Vashon et al. 2005a). Thus, a lynx population can only persist in a large boreal forested landscape that

contains appropriate forest types, snow depths and high snowshoe hare densities. In the Northeast, lynx were most likely to occur in areas that support deep snow (greater than 268 centimeters [106 inches] annual snowfall) associated with regenerating boreal forests in landscapes 100 square kilometers (40 square miles) or greater in area (Hoving et al. 2003). We assume areas with smaller patches of boreal forest are unlikely to provide a sufficient amount of habitat suitable to support a lynx population.

Lynx populations in the contiguous United States seem to be influenced by lynx population dynamics in Canada (Thiel 1987; McKelvey et al. 2000a, c). Many of these populations in Canada are directly interconnected to U.S. populations, and are likely a source of emigration into contiguous United States lynx populations. Therefore, we assume that retaining connectivity with larger lynx populations in Canada is important to ensuring long-term persistence of lynx populations in the U.S. We assume that, regionally, lynx within the contiguous United States and adjacent Canadian provinces interact as metapopulations and, therefore, assessments of population viability must be made at this larger scale and not solely based on populations within the contiguous United States.

Status and Distribution

The historical and present range of the lynx north of the contiguous United States includes Alaska and that part of Canada that extends from the Yukon and Northwest Territories south across the United States border and east to New Brunswick and Nova Scotia. In the contiguous United States, lynx historically occurred in the Cascades Range of Washington and Oregon; the Rocky Mountain Range in Montana, Wyoming, Idaho, eastern Washington, eastern Oregon, northern Utah, and Colorado; the western Great Lakes Region; and the northeastern United States region from Maine southwest to New York (McCord and Cardoza 1982; Quinn and Parker 1987). A thorough discussion and interpretation of lynx records through time is found in the Service's final rule (March 24, 2000, 65 FR 16052) and clarification of our findings (July 2003; 68 FR 40076).

The distribution of lynx in North America is closely associated with the distribution of North American boreal forest (Agee 2000). In Canada and Alaska, lynx inhabit the classic boreal forest ecosystem known as the taiga (McCord and Cardoza 1982; Quinn and Parker 1987; Agee 2000; McKelvey et al. 2000b). The range of lynx extends south from the classic boreal forest zone into the subalpine forest of the western United States, and the boreal/hardwood forest ecotone in the eastern United States (Agee 2000; McKelvey et al. 2000b). Forests with boreal features (Agee 2000) extend south into the contiguous United States along the Cascade and Rocky Mountain Ranges in the west, the western Great Lakes Region, and along the Appalachian Mountain Range of the northeastern United States. Within these general forest types, lynx are most likely to persist in areas that receive deep snow (Ruggiero et al. 2000). Lynx are rare or absent from the wet coastal forests of Alaska and Canada (Mowat et al. 2000).

At its southern margins in the contiguous United States, forests with boreal features, or southern boreal forests, become naturally fragmented as they transition into other vegetation types. Southern boreal forest habitat patches are small relative to the extensive northern boreal forest of Canada and Alaska, which constitutes the majority of lynx range. Many southern boreal forest habitat patches within the contiguous United States cannot support resident populations of lynx and their primary prey species.

The complexities of lynx life-history and population dynamics, combined with a general lack of reliable population data for the contiguous United States, make it difficult to ascertain the past or present population status of lynx in the contiguous United States. It is difficult to determine with certainty whether reports of lynx in many States were (1) animals dispersing from northern populations that were effectively lost because they did not join or establish resident populations, (2) animals that were a part of a resident population that persisted for many generations, or (3) a mixture of both resident and dispersing animals.

The final rule determining threatened status for the lynx in the contiguous United States summarized lynx status and distribution across four regions that are separated from each other by ecological barriers consisting of spans of area lacking lynx habitat (March 24, 2000, 65 FR 16052). These distinct regions are the Northeast, the Great Lakes, the Northern Rocky Mountains/Cascades, and the Southern Rocky Mountains. While these regions are ecologically unique and discrete, the lynx is associated with only the southern boreal forest in each and, with the exception of the Southern Rocky Mountains Region, each area is geographically connected to the much larger population of lynx in Canada.

The following summarizes status and distribution information of the lynx DPS in the contiguous United States:

Northeast Region (Maine, New Hampshire, Vermont, New York)—Based on an analysis of cover types and elevation zones containing most of the lynx occurrences, McKelvey et al. (2000b) determined that, at the broad scale, most lynx occurrence records in the Northeast were found within the "Mixed Forest-Coniferous Forest-Tundra" cover type at elevations ranging from 250 to 750 meters (820 to 2,460 feet). This habitat type in the northeast United States occurs along the northern Appalachian Mountain range from southeastern Quebec, western New Brunswick, and western Maine, south through northern New Hampshire. This habitat type becomes naturally more fragmented and begins to diminish to the south and west, with a disjunct segment running north-south through Vermont, an extensive patch of habitat in the Adirondacks of northern New York, and with a few more distant and isolated patches in Pennsylvania (see Figure 8.23 in McKelvey et al. 2000b).

In the northeast, information on the presence of lynx was limited at the time of listing in 2000. In 1999, 6 lynx were radio-collared in northern Maine (March 24, 2000; 65 FR 16052). As of 2004, Maine Department of Inland Fisheries and Wildlife had radio-collared 43 lynx and documented 30 litters (Vashon et al. 2005b) Records show lynx to currently be distributed throughout northern Maine (November 9, 2005; 70 FR 68294). Lynx in Maine

currently have high productivity; 91 percent of available adult females older than 2 years produced litters averaging 2.83 kittens (Vashon et al. 2005b). This area is the only area in the northeastern region of the lynx's range within the contiguous United States that currently supports breeding lynx populations and likely acts as a source or provides connectivity for peripheral portions of the lynx's range in the Northeast.

The preponderance of lynx habitat in this region occurs on private lands in the State of Maine. Federal agencies manage a minor amount of lynx habitat in this region. The final rule for critical habitat summarizes a number of private land conservation efforts for lynx in the region (November 9, 2006, 71 FR 66009).

Great Lakes Region (Minnesota, Wisconsin, Michigan)—The majority of lynx occurrence records in the Great Lakes Region are associated with the "mixed deciduous-coniferous forest" type (McKelvey et al. 2000b). Within this general forest type, the highest frequency of lynx occurrences were in the *Acer saccharum* (sugar maple), *Tilia* spp. (basswood), *Pinus banksiana* (jack pine), *P. strobus* (white pine), and *P. resinosa* (red pine) forest types (McKelvey et al. 2000b). These types are found primarily in northeastern Minnesota, northern Wisconsin, and the western portion of Michigan's Upper Peninsula.

Mixed deciduous-coniferous forest covers an extensive area in this region, but much of this area is considered marginal habitat for lynx because it is a transitional forest type at the edge of the snowshoe hare range. Habitat at the edge of hare range supports lower hare densities (Buehler and Keith 1982) that may not be sufficient to support lynx reproduction. Snow depths within appropriate habitat that allow lynx a competitive advantage over other carnivores (i.e., coyotes) occur only in limited areas in northeastern Minnesota, extreme northern Wisconsin, and Michigan's upper peninsula.

At the time of listing, we were unsure of whether the Great Lakes Region supported resident populations of lynx or if lynx documented in these areas were simply dispersing from Canada (March 24, 2000; 65 FR 16052) (McKelvey et al. 2000b). Since that time, numerous lynx have been verified from northeastern Minnesota through DNA analysis, radio- and GPS-collared animals, and documentation of reproduction (November 9, 2005; 70 FR 68294). Northeastern Minnesota is the only area in the Great Lakes region for which we have evidence of recent lynx reproduction; as such, it likely acts as a source or provides connectivity for more peripheral portions of the lynx's range in this region.

The Forest Service in Minnesota manages a preponderance of lynx habitat in this region. All National Forests in the region have amended or revised their Plans, and so addressed in part, on National Forest lands, the primary factor threatening the lynx: inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of lynx in National Forest Plans and BLM Plans. These include the Chippewa, Superior, Hiawatha, and Ottawa National Forests. Voyageurs National Park in Minnesota was designated as lynx critical habitat in 2006. This designation will ensure that lynx habitat within the park will be managed to conserve lynx.

The final rule for critical habitat summarizes other private land conservation efforts for lynx in the region (November 9, 2006, 71 FR 66009).

Northern Rocky Mountain/Cascades Region (Washington, Oregon, Idaho, northwestern Wyoming, Utah)—In this region, the majority of lynx occurrences are associated at a broad scale with the "Rocky Mountain Conifer Forest;" within this type, most of the occurrences are in moist Douglas-fir (*Pseudotsuga menziesii*) and western spruce/fir forests (McKelvey et al. 2000b). Most of the lynx occurrences are in the 1,500-2,000 meters (4,920-6,560 feet) elevation class (McKelvey et al. 2000b). These habitats are found in the Rocky Mountains of Montana, Idaho, eastern Washington, and Utah, the Wallowa Mountains and Blue Mountains of southeast Washington and northeastern Oregon, and the Cascade Mountains in Washington and Oregon. The majority of verified lynx occurrences in the United States and the confirmed presence of resident populations are from this region. The boreal forest of Washington, Montana, and Idaho is contiguous with that in adjacent British Columbia and Alberta, Canada.

Northwestern Montana and the north Cascades in Washington currently have resident lynx populations, and strong evidence exists to support the presence of resident lynx distributed throughout much of the forest types considered lynx habitat in Montana and Washington (November 9, 2005; 70 FR 68294). Resident lynx populations exist in contiguous habitats in Idaho, Montana and northwestern Wyoming in the Greater Yellowstone Area (e.g., Murphy et al. 2004). Lynx have probably always occurred only intermittently in peripheral areas of Oregon and Utah, although the historical or current presence of resident populations in either of these States has not been confirmed.

The North Cascades, Yellowstone and Glacier National Parks manage substantial amounts of lynx habitat in this region. Lynx occur in all three National Parks. Through National Park Service management, lynx habitat is generally managed in ways that promote natural ecological processes, which benefits lynx. Glacier National Park provides a large expanse of lynx habitat that is contiguous with lynx habitat in Canada. Of the three Parks, Glacier and North Cascades were determined to meet the habitat criteria requirements for critical habitat, and were designated critical habitat in 2006. This designation will further ensure that lynx habitat within the Parks will be managed to conserve lynx.

The BLM Spokane District in Washington manages lynx habitat and its Resource Management Plan was modified in 2003 to incorporate the provisions of the LCAS. On November 30, 2006, the Service completed consultation with the BLM for the revision of their Coeur d'Alene Resource Management Plan in which lynx were addressed. The Missoula BLM district has also amended their plan to abide by the standards and guides in the LCAS. The Cottonwood BLM in southern Idaho is in the process of amending their plan for lynx.

The Forest Service manages the preponderance of lynx habitat in this region. Through the Northern Rockies Lynx Amendment, 18 National Forests in the region addressed the primary

factor threatening the lynx on National Forest lands: inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of lynx in National Forest Plans and BLM Plans. The Boise, Payette, and Sawtooth National Forests of Idaho have amended or revised their Plans to address this factor, as have the Uinta and Wasatch-Cache National Forests in Utah. Region 6 of the Forest Service in Washington intends to address this factor through Forest Plan revision, which has started for the Okanogan-Wenatchee and Colville (all occupied by lynx), and the Malheur, Wallowa-Whitman, Umatilla (unoccupied) National Forests. The Mount Baker National Forest Plan is not yet in revision.

The final rule for critical habitat summarizes other private land conservation efforts for lynx in the region (November 9, 2006, 71 FR 66009). See also the discussion in this biological opinion, under *Cumulative Effects*.

Southern Rocky Mountains Region (Colorado, southeastern Wyoming)—Colorado represents the extreme southern edge of the range of the lynx. A majority of the lynx occurrence records in Colorado and southeastern Wyoming were associated with the "Rocky Mountain Conifer Forest" type. The occurrences in the Southern Rockies were generally at higher elevations (8,000-12,000 feet) than were all other occurrences in the West (Ruediger et al. 2000).

The southern boreal forest of Colorado and southeastern Wyoming is isolated from boreal forest in Utah and northwestern Wyoming by the Green River Valley and the Wyoming basin (Findley and Anderson 1956 in McKelvey et al. 2000b). We believe that these areas likely reduce opportunities for genetic interchange with the Northern Rocky Mountains/Cascades Region and Canada (Halfpenny et al. 1982; Koehler and Aubry 1994). However, although habitats in the Southern Rockies are far from source populations and more isolated, it is still possible that dispersers could arrive in the Southern Rocky Mountains during highs in the population cycle. A number of lynx from the reintroduced population in Colorado have recently dispersed great distances, with occurrences located in Kansas, Nevada, South Dakota, Arizona, Idaho, Nebraska, Montana, Wyoming and New Mexico (T. Shenk, pers. comm. 2007 *in* NRLA BO). Thirty-three different individuals were located in Wyoming, seven in Montana and six in Nebraska. Such information indicates that dispersing lynx are able to traverse long distances across extremely variable terrain.

A resident lynx population likely occurred historically in the Southern Rocky Mountains Region, based on the records of lynx in Colorado and the persistence of contiguous habitat in southeastern Wyoming with the Colorado habitat. This resident population may have been extirpated, which led the Colorado Division of Wildlife (CDOW) to undertake a reintroduction effort that is currently in progress. Due to CDOW's efforts, 218 adult lynx were released between 1999 and 2006. (See *Environmental Baseline, Status of the Species within the Action Area* for more information on the reintroduction on lynx into Colorado).

The Forest Service manages the preponderance of lynx habitat in this region. The Forests in this region include the Medicine Bow, Routt, Arapaho-Roosevelt, Pike and San Isabel, Rio

Grande, White River, Grand Mesa, Uncompahgre, Gunnison, and the San Juan National Forests.

Reports from other locations—During the early 1960's, concurrent with an unprecedented cyclic high in Canada, lynx moved into the Great Plains and the Midwest Region of the United States (Gunderson 1978; Mech 1980; DeStefano 1987). These records are outside of the southern boreal forests where most lynx occurrences are found (McKelvey et al. 2000b). We consider lynx observations in Nevada, North Dakota, South Dakota, Iowa, Nebraska, Indiana, Ohio, and Virginia to be individuals dispersing subsequent to periods of cyclic high lynx numbers in Canada (Hall and Kelson 1959; Burt 1954 in Brocke 1982; McKelvey et al. 2000b). We do not consider these States to be within the contiguous United States range of lynx (65 FR 16052, March 24, 2000).

Recovery Outline

We developed a recovery outline for lynx in the contiguous United States (Service 2005). The outline serves as an interim strategy to guide recovery efforts until a final recovery plan is completed. The lynx recovery outline presents our current understandings of historical and current lynx distribution, ecology, and population dynamics.

The outline introduces concepts regarding the relative importance of different geographic areas to the persistence of lynx in the contiguous United States, identifying areas as either core, provisional core, secondary or peripheral based on lynx records over time and evidence of reproduction. The recovery outline provides four preliminary recovery objectives, which are accompanied by recovery actions needed to attain objectives. A discussion of the how the proposed action relates to the recovery outline can be found later in this document, under the *Effects of the Action* section.

In addition to determining whether an area is occupied by lynx, the Service examined lynx habitat and designated areas according to their known or projected quality and importance in lynx recovery. The areas with the strongest long-term evidence of the persistence of lynx populations within the contiguous United States are defined as "core areas." Core areas have both persistent verified records of lynx occurrence over time and recent evidence of reproduction. Six core areas along with a provisional core area within the Southern Rockies (Colorado and southern Wyoming) were identified within the contiguous United States. The provisional core area in the Southern Rockies was identified because it contains a reintroduced population. Reproduction has been documented in this introduced population; however, it is too early to determine whether a self-sustaining lynx population will result. "Focusing lynx conservation efforts on these core areas will ensure the continued persistence of lynx in the contiguous U.S by addressing fundamental principles of conservation biology."

The recovery outline continues, "At this time, the role of areas outside of core areas in sustaining lynx populations in the contiguous United States is unclear. The fluctuating nature of lynx population dynamics and the ability of lynx to disperse long distances have resulted in many individual occurrence records outside of core areas, without accompanying evidence of historic or current presence of lynx populations." Areas classified as "secondary areas" are those with historical records of lynx presence with no record of reproduction; or areas with historical records and no recent surveys to document the presence of lynx and/or reproduction. If future surveys document presence and reproduction in a secondary area, the area could be considered for elevation to core. We hypothesize that secondary areas may contribute to lynx persistence by providing habitat to support lynx during dispersal movements or other periods, allowing animals to then return to "core areas." In "peripheral areas", the majority of historical lynx records is sporadic and generally corresponds to periods following cyclic lynx population highs in Canada.

ENVIRONMENTAL BASELINE

Status of the Species within the Action Area

Lynx Occurrence

Verified records after the 1920's are rare in southern Wyoming and in Colorado, with central Colorado being the "core" area of lynx records until the early 1970's. A statewide lynx verification program was conducted in Colorado from 1978-1980 and concluded that a viable but low-density lynx population persisted in Eagle, Pitkin, Lake, and Clear Creek counties with evidence of lynx occurrence in Grand and Park Counties. Lack of evidence from other parts of lynx range in Colorado may have been due to lack of adequate surveys. While the surveys did not cover the entire state, they were sufficient to conclude that lynx at that time were rare in the Southern Rockies.

Even though lynx individuals appeared to persist in the Southern Rockies landscape, the population did not rebound despite the removal of key suppressing factors such as commercial trapping and indiscriminate predator control. It was believed that the population was so small in Colorado that it was incapable of rebounding and was augmented with a re-establishment program beginning in 1999. CDOW has released a total of 218 lynx in the San Juan Mountains of southwestern Colorado from 1999 to 2006. Of the total 218 lynx released, there are 80 known mortalities as of June, 2006: 21% due to starvation or disease, 31% were human-induced and were attributed to vehicle collisions or gunshot, and 33% unknown causes (Shenk 2006). This mortality pattern can be expected from reintroduced animals due to unfamiliarity with the area and large-scale movements often characteristic of reintroduced animals. Highway mortality ranks as one of the highest human-caused mortalities factors for the Colorado lynx reintroduction overall, and the highest human-caused mortality factor since release protocols were adjusted, which reduced the deaths caused by starvation after the first year of the reintroduction effort. By adjusting the release protocol, CDOW substantially reduced the number of starvation deaths; only two lynx have

died of starvation under their current release protocol, one in 2000 and one in 2001 (Shenk 2004). In a recent update, Shenk (pers. comm. 2008) stated that there now have been 109 confirmed mortalities, although specific information was not provided on the cause of mortality. An additional mortality was reported in June 2008, in which the apparent cause of death was starvation (K. Broderdorp, pers. comm. 2008).

Reproduction has been documented, with 37 dens with an average of 3 kittens each located from 2003-2006. In 2006, a female lynx that was born in Colorado gave birth to a litter of kittens, documenting the first recruitment of a Colorado-born lynx into the Colorado breeding population. To date, 216 kittens have been documented born in Colorado (Shenk pers. comm. 2008). No reproduction was documented in Colorado in 2007 and, as of July 2008, no reproduction was documented in 2008 (Shenk pers. comm. 2008). The CDOW did not reintroduce any lynx in Colorado in 2007. As of July 11, 2008, the CDOW reported they are still regularly monitoring 50 of the original 218 lynx released in Colorado that are equipped with radio transmitter collars (CDOW 2008). The current "core" area, as identified by the CDOW, for lynx in Colorado is from the New Mexico border to the north to Gunnison, west to Taylor Mesa and east to Monarch Pass (Shenk 2006).

Lynx Habitat

Lynx habitat in the Southern Rocky Mountains is usually found in the subalpine and upper montane forest zones, typically between 8,000 and 12,000 feet in elevation. Upper elevation subalpine forests are dominated by subalpine fir and Engelmann spruce. As the subalpine zone transitions down to the upper montane, spruce-fir forests begin to give way to a predominance of lodgepole pine, aspen, or mixed stands. Engelmann spruce and/or subalpine fir may retain dominance on cooler, more mesic mid-elevation sites, intermixed with aspen, lodgepole pine, and Douglas-fir. White fir appears in the San Juan Mountains, Sangre de Cristo Range, and Wet Mountains in southern Colorado. The lower montane zone is dominated by ponderosa pine, pinyon pine/juniper communities and Douglas-fir, with pine typically dominating on lower, drier, more exposed sites, and Douglas-fir occurring on moister and more sheltered sites. Although the lower montane zone is generally below occupied lynx habitat, montane forests can be important as connective travel habitat where they may facilitate lynx dispersal and movements between blocks of lynx habitat, and may provide some foraging opportunities during those movements.

In the Southern Rocky Mountains, most lynx habitat forest types occur on Federal lands in public management, including National Parks, BLM, and National Forest System lands. Forests in the SRLA area are naturally patchy, with many openings and breaks in forested canopies and lynx habitat is often present within a habitat mosaic of vegetation types, rather than as simple vegetation types. Spruce-fir, lodgepole pine, white fir, aspen-conifer mix, and mesic Douglas-fir may all provide foraging and/or denning habitat for lynx. Also potentially important in many parts of the SRLA area are the high elevation sagebrush and mountain shrub communities found adjacent to or intermixed with forested communities, affording potentially important alternate

prey resources and travel habitat. Riparian and wetland shrub communities (e.g., willow, alder, serviceberry) found in valleys, drainages, wet meadows, and moist timberline locations may also support important prey resources as well as travel corridors. Many parts of the Southern Rockies have a shortage of dense, early successional forest stands, particularly in lodgepole pine.

Lynx habitat in southern Wyoming and Colorado is somewhat geographically isolated from the rest of the Rocky Mountain chain by the vast sagebrush and desert shrub expanses of the Wyoming Basin and the Red Desert in Wyoming and similar vegetation patterns in the Green and Colorado River plateaus in western Colorado and eastern Utah. This geographic isolation may have some long-term implications for maintenance of lynx populations in the Southern Rocky Mountain Geographic Area (SRMGA), as lynx from the northern meta-populations may not be able to easily disperse into this area. However, lynx are capable of long-distance dispersals, as shown by 33 of the 218 reintroduced lynx that moved from Colorado to Wyoming, Montana, and Nebraska.

Studies in northern Wyoming (Beauvais 2001) and a more limited study in Colorado found that snowshoe hares had a strong affinity for the higher elevation mature to late-successional spruce-fir forests. The Wyoming study showed that hares were out-competed by other species in early successional stages (less than 15 years of age); however, these altered conditions probably were not yet providing hare habitat. In Colorado, Dolbeer and Clark (1975) reported higher survival of snowshoe hares in mature spruce-fir forests and mixed spruce-fir/lodgepole pine forests, which contained dense undercover, than in open lodgepole stands lacking understory. The Colorado study was conducted in a very limited area, and did not sample younger sapling stage stands (15 to 40 years) to compare hare densities with those that were reported for mature and late-successional spruce-fir forests. Therefore, it remains somewhat unclear what role early-successional forests play in providing snowshoe hare habitat in the SRMGA; however, it is generally accepted that they are of more value than mid-successional stages, especially in lodgepole pine, based on literature from the northern boreal forests. Extensive pure stands of aspen may not provide quality habitat for hares due to deficiencies in winter habitat characteristics. Some of these pure aspen stands have not been mapped as lynx habitat in this portion of the SRMGA as they are not in close enough proximity to winter or denning habitats, and therefore would not be expected to provide the required components for lynx home ranges.

Lynx habitat in the Southern Rockies is naturally fragmented due to alpine tundra, open valleys, shrubland communities, and dry vegetation types associated with southerly and westerly exposures or lower montane zone elevation. Because of the southerly latitude, lynx habitats (spruce-fir, lodgepole pine, and mixed aspen-conifer forests) are typically found in elevational bands along the flanks of mountain ranges or on high plateaus. Although fragmented, lynx habitat remains generally interconnected through the numerous mountain chains and intervening low elevation forests and brushlands. Important topographic features and vegetative communities link these fragmented forested landscapes of habitat together, providing for movement of individuals within and between LAUs. Connectivity may be provided by narrow forested mountain ridges or plateaus that connect more extensive mountain habitats, or by wooded riparian communities that provide travel ways across open valley floors between

mountain ranges. Lower elevation ponderosa pine, pinyon-juniper woodlands, or shrublands may also serve the same function.

Lynx Habitat Maps

National Forests mapped lynx habitat beginning in 1999, using the best available information on lynx and the best available mapping technology. The accuracy and precision of mapping methods varied among Forests. As projects are planned, these maps are typically ground-truthed by biologists, in some cases with assistance from the Lynx Biology Team and lynx scientists. As further investigation informs the mapping efforts, it may be determined that some of the area has lynx habitat that is of poorer quality or occurs in less abundance than originally believed.

Table 1 shows the modeled habitat (denning, winter foraging, and other lynx foraging habitat) within LAUs for the SRLA area. Approximately 10.9 million acres of NFS lands occur within LAUs, of which approximately 7.6 million acres is lynx habitat.

Table 1. NFS Acres of Lynx Habitat within the Southern Rockies Amendment Area

National Forest	Total NFS Lynx habitat Acres	NFS Denning/Winter Forage Habitat*	NFS Winter Forage (Non-Denning)*	NFS Other Lynx Foraging	Total NFS Suitable Lynx Habitat	NFS Currently Unsuitable Lynx Habitat
Arapaho-Roosevelt	690,082	159,630	481,654	32,354	673,638	16,444
GMUG	1,641,664	615,822	224,208	787,537	1,627,568	14,096
Medicine Bow/Routt	1,192,466	171,103	128,978	858,852	1,158,933	33,533
Pike-San Isabel	826,156	274,515	269,385	276,546	820,446	5710
Rio Grande	1,035,420	373,005	187,538	392,357	952,900	82,520
San Juan	1,048,567	452,392	110,361	427,280	990,033	58,534
White River	1,142,794	459,800	321,382	344,580	1,125,762	17,032
Total:	7,577,149	2,506,267	1,723,506	3,119,506	7,349,280	227,869

GMUG: Grand Mesa, Uncompahgre, Gunnison National Forests

*Denning habitat, in this table, is also considered winter foraging habitat, so the two columns can be added to get total winter forage habitat.

In accordance with the LCAS, the percentage of lynx habitat that is in early seral stages, due to timber harvest, fire, and insects, is tracked within each LAU in order that the LAU continues to provide an adequate amount of habitat to support a resident lynx and to provide

a continuous supply of foraging habitat. The LCAS recommends limiting the early seral stages of lynx habitat to no more than 30 percent in an LAU. Within the SRLA area, the percentage of lynx habitat in the early seral stage ranges from 3 to 8 percent in most of the LAUs, however there are some exceptions. One LAU has exceeded the 30 percent unsuitable amount due to a large wildfire in 2004 (the Missionary Ridge Fire on the San Juan National Forest) (Forest Service 2008). Also, several LAUs in Colorado have exceeded this amount as result of the mountain pine beetle epidemic. Additional LAUs are expected to exceed the 30 percent unsuitable amount as the epidemic progresses.

Lynx Denning Habitat

Approximately 2.5 million acres currently meet modeled denning habitat characteristics in the SRLA area forests (Table 1). Denning habitat is defined as habitat used during parturition and rearing of young until they are mobile, and is characterized by large amounts of coarse woody debris that provide escape and thermal cover. Denning habitat in the Southern Rockies is likely to occur most often in late-successional spruce-fir forest with a substantial amount of large diameter woody debris on the forest floor. Lodgepole pine and Douglas-fir stands can also be denning habitat provided that the cool, moist conditions and coarse woody debris are present. Usually these conditions occur in lodgepole stands that are successional to the spruce-fir habitat type. Engelmann spruce and subalpine fir are often present in the stand. Denning habitat often is found on, but is not restricted to, northerly exposures due to the cooler conditions. In Colorado, den sites have a mean elevation of 11,004 feet (ranging between 10,226 and 11,765 feet), with a mean 30 degree slope, generally north facing, with a dense understory of coarse woody debris (Merrill and Shenk 2006). In the SRLA area, all modeled denning habitat is also considered foraging habitat, as lynx denning habitat contains the habitat characteristics needed by snowshoe hares as well.

The LCAS recommends that, of the lynx habitat within a LAU, at least 10 percent should consist of denning habitat. Currently, most LAUs in the SRLA area consist of 20-50 percent modeled denning habitat. This state is due to the large occurrence of older successional stage forested stands in the Southern Rockies, which were regenerated during the large fires of the mid to late 1800's. Lack of large fires and long fire return intervals for spruce-fir are the most probable reasons for the large amount of mature spruce-fir, which usually provides good denning habitat due to the natural disturbance processes associated with it, such as blowdown, insects and disease.

Lynx Foraging Habitat

Foraging habitat for lynx in the SRLA area includes the primary forest types (spruce-fir and lodgepole pine) and secondary forest types (Douglas-fir and aspen) that make up lynx habitat. Spruce-fir occupies 45 percent of the lynx habitat in the SRLA area. Aspen stands account for 25 percent of the lynx habitat, lodgepole occurs on 22 percent, and Douglas-fir and mixed conifer occupy 8 percent of the lynx habitat within the SRLA area. Also important are the high elevation sagebrush and mountain shrub communities, and riparian and wetland shrub

communities found in adjacent valleys, drainages, wet meadows, and moist timberline locations as these areas may support alternate prey resources.

Winter is a limiting season for many wildlife species, including the lynx. Winter foraging areas are those that have the structural characteristics that provide cover and food for snowshoe hares through the deep snow conditions of winter. These areas also provide yearlong habitat for hares. In summer, hares shift their diet to a higher proportion of grasses, forbs, and herbaceous portions (new growth) of shrubby species that are not available in winter, and thus may occupy additional areas in summer where these plants are more abundant and available. National Forests in the SRLA area have modeled winter foraging habitat as a subset of all lynx habitat. Currently, there are approximately 4.23 million acres of modeled winter foraging habitat in the SRLA area (Table 1).

Disturbance Regimes in Lynx Habitat

In the western United States, fire historically played an important role in maintaining the mosaic of forest successional stages that provide habitat for both snowshoe hare and lynx (Fox 1978; Bailey et al. 1986; Quinn and Thompson 1987; Koehler and Brittell 1990; Poole et al. 1996; Slough and Mowat 1996). Periodic fire maintains this mosaic by reducing forest stands to early seral stages. Early successional stages lack horizontal cover, and snowshoe hare densities within them are typically low. However, snowshoe hare populations increase as the vegetation (trees and/or understory trees and shrubs) grows back to provide dense horizontal cover. Hare populations decrease as the stand matures and the lowest limbs of trees grow out of the reach of hares, and/or the understory is suppressed by the stand's closed canopy. A typical example of the importance of fire within the SRLA area is fires' role in a mature stand of lodgepole pine, which provides little snowshoe hare forage. Fire in such stands is typically very hot, resulting in stand replacement. Such stands typically regenerate into large, dense stands of lodgepole pine seedlings and then saplings, which provide quality snowshoe hare habitat. Low to moderate intensity fires also may stimulate understory development in older, mixed conifer stands. Fire exclusion may have altered the pattern and composition of vegetation in some lynx habitat within the action area (Hillis 2003). Others suggest that fire suppression has not been as significant in lynx habitat vegetation types as in other regimes (Agee 2000).

Fires in spruce-fir forests are generally stand replacement events because of their severity or the inability of the trees to withstand even moderate temperatures associated with fires. Fire frequency in the SRMGA boreal forests ranges from 100 to 400 years. Natural barriers, such as large open parklands, lakes, reservoirs and barren ridges, often play a role in how extensive fires become in the SRMGA boreal forests.

Insects also play a role in the disturbance regimes of SRMGA boreal forests. Most important are the mountain pine beetle in lodgepole pine and the spruce beetle in spruce-fir forests. Mountain pine beetle generally infest large diameter trees, which can naturally thin, or create openings within the lodgepole pine stands. In an extreme epidemic, an entire even-aged stand could be

killed, thus regenerating the stand. Spruce beetle, at endemic levels, create small openings or canopy gaps by killing small areas of mature trees. At epidemic levels, which are most common in over-mature stands, the predominant response is the release of sub canopy trees of both spruce and fir (Veblen et al. 1991). These large outbreaks also result in additional herbaceous growth on the forest floor.

Connectivity

Lynx require a regional or sub-regional approach to connectivity management because of their free ranging habits. Lynx need to be able to move between different geographic areas and mountain ranges. In some cases, they move long distances through unfavorable habitat. If linkages or corridors are blocked because of human alteration, lynx populations can become isolated and more vulnerable to extirpation in the long term.

The Southern Rocky Mountains have a naturally fragmented spatial pattern of lynx primary habitat. Ruediger et al. (2000, pg. 4-23) states:

> *In the Southern Rockies, urban expansion and development has further fragmented an already patchy distribution of lynx habitat; Valley floor development continually erodes the amount of non-forest habitats; The expansion of homes and some municipal facilities up mountain slopes, into forests of aspen, lodgepole pine, and to a lesser degree spruce-fir, adds to the fragmentation of a naturally fragmented landscape; The cumulative effect of private land development and expansion of recreational facilities in and adjacent to lynx habitat may reduce the ability of lynx to move throughout their home range, or interact with other individuals in the larger subpopulation.*

The capability to maintain a meta-population in this area depends on successful dispersal between habitat fragments, and potentially between geographic areas. Increased fragmentation and isolation has occurred due to cumulative impacts from highways and residential and recreational development often tied to ski areas developed on National Forest System lands (Hickenbottom et al. 1999). While the ecosystem remains largely interconnected at this time, ongoing development and other activities continue to pressure those linkages. Since the SRMGA may not be connected to the Northern Rockies due to large expanses of desert in between, maintenance of regional scale habitat connectivity is perhaps more important in this geographic area than any other (Hickenbottom et al. 1999). The I-70 highway corridor, along with the development of resorts and the associated subdivisions and entire communities, has compromised the permeability of portions of the area in the center of the SRMGA.

Land Management Allocations

In the SRLA area, Federal land accounts for the preponderance of lynx habitat. Of this habitat, the Forest Service manages the vast majority of acres. Therefore, Federal land management, specifically under the Forest Plans, has the potential to exert substantive effects on lynx populations in geographic areas.

Table 2 shows three broad groups of management area emphases for National Forests in the SRLA area. Developmental allocations are managed for a broader range of multiple-uses, and are separated into two groups in Table 2. The first represents development allocations characterized by generally lower levels of multiple-use (less development) and the second group of development allocations represents full multiple-use management activities (allows for more development).

Table 2. Groups of Land Management Allocations by Percent of Lynx Habitat

Forest	Percent Non-developmental	Percent Developmental (Low multiple use – some development)	Percent Developmental (Full multiple use – allows more development)
Arapaho-Roosevelt	41%	30%	29%
GMUG	20%	21%	59%
Medicine Bow/Routt	37%	11%	52%
Pike-San Isabel	25%	29%	46%
Rio Grande	22%	35%	43%
San Juan	34%	34%	32%
White River	46%	8%	46%
Average (%)	32	24	44

Note: The Medicine Bow/Routt, Arapaho-Roosevelt, Rio Grande and White River National Forests follow newer forest plan management area descriptors. The Grand Mesa-Uncompahgre-Gunnison (GMUG), Pike-San Isabel, and San Juan National Forests follow the older forest plan management area descriptors.

In the SRLA area, a total of 2.37 million acres (32 percent) of all NFS acres of lynx habitat are in non-developmental management area allocations. Most of these "non-developmental allocation" lands are in wilderness areas, research natural areas, and other similar allocations that generally have minimal impacts from human activities, except for fire suppression. The risks to lynx and lynx habitat are considered minimal within these allocations but the lack of vegetative management activity limits opportunities to create foraging habitat. However, some management activities occurring or being considered in wilderness areas, such as grazing and wildland fire use, may have some effects on lynx or lynx habitat.

Twenty-four percent of all NFS lands in mapped lynx habitat are in developmental management area allocations in which potential impacts from management activities are low to moderate. These lands include allocations for special interest areas, backcountry uses, scenic rivers and byways, a variety of dispersed recreation uses, municipal watersheds, and corridors connecting core areas. A variety of potential impacts to lynx and lynx habitat exist from multiple use

activities. Anticipated impacts from habitat modification, road construction, motorized recreation, developed recreation, or other developments are relatively low and/or localized due to restrictions placed on them in existing Forest Plans.

Forty-four percent of all NFS lands in mapped lynx habitat are in developmental management area allocations managed for a full range of multiple use activities. These lands include allocations for forest vegetation management (wood fiber production), range vegetation management, other forest products, big game winter range, habitat for wildlife management indicator species, ski-based resorts and other developed recreation complexes, administrative sites, residential/forest interface, and utility corridors. Potential impacts to lynx and lynx habitat from multiple use activities associated with these land allocations are the greatest relative to other land allocations.

Factors identified in the Final Listing Rule and Remanded Decision

The final rule (March 24, 2000; 65 FR 16052) concluded that the primary factor threatening the lynx DPS is the inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of lynx in Federal land management Plans. The Service concluded that the lack of Plan guidance for conservation of lynx, as evidenced by the fact that, at the time of listing, Plans allowed or directed actions that cumulatively adversely affect lynx, was a significant threat to the contiguous United States DPS of lynx. Our remanded determination in our clarifications of findings of our final rule (July 2003; 68 FR 40076) affirmed the findings in the final rule.

Land Management Authorities

The 1982 National Forest Management Act regulations (36 CFR 219.19) provided the following direction to the Forest Service, "Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species."

As described previously, the final rule identified the single factor threatening the contiguous United States DPS of lynx as the inadequacy of existing regulatory mechanisms; specifically the lack of guidance provided in the Plans for avoiding adverse impacts to lynx and for the conservation of lynx on Forest Service administered lands. National Forests encompass a preponderance of lynx habitat, especially in the western States. Thus, Forest Service land management practices can significantly influence the maintenance of lynx habitat and their prey. Many of the existing Plans had general provisions for conservation/management of wildlife and wildlife habitats, but very few specifically address lynx (Hickenbottom et al. 1999). Plans that had specifically addressed lynx at the time of listing had not incorporated the information in the Science Report or LCAS, which were then considered to be the most current knowledge regarding lynx conservation.

Risk Factors within Federal Authority and Jurisdiction

In the LCAS, the Lynx Biology Team identified potential risk factors to lynx that are within the authority and jurisdiction of the Federal land management agencies to control. As written, the existing Plans allow, but do not necessarily direct or require, actions that could result in risks to lynx. Some of these risk factors occur within the SRLA area. Lynx risk factors listed in the BA include:

I. FACTORS AFFECTING LYNX PRODUCTIVITY
- Conversion or alteration of native plant communities
- Fire suppression and hazardous fuels reduction
- Grazing
- Pre-commercial thinning
- Recreational use
- Road and trail access
- Timber management

II. FACTORS AFFECTING LYNX MORTALITY
- Highways
- Predation by other species
- Predator control activities
- Shooting

III. FACTORS AFFECTING LYNX MOVEMENTS
- Highways and associated developments
- Private land development

These factors have varying effects on lynx, depending upon the nature, location, duration and timing of the activity. Some present more likelihood of risks to lynx, others are relatively benign in effects. In non-developmental management allocations, a number of these factors would not affect lynx. Importantly, the rather substantial risks to lynx habitat that are often associated with some vegetation management actions (e.g., timber management and pre-commercial thinning) typically do not arise in areas in non-developmental allocations. Factors affecting lynx mortality, including those associated with highways, predator control, and private land development activities generally are not an issue in non-developmental areas. Factors such as shooting, while not entirely eliminated, are lessened significantly in non-developmental areas due to limited access for people.

The Forest Service has varying levels of authority and jurisdiction over the factors listed above, especially as they relate to risks to lynx. For instance, the Forest Service typically has little influence on highways and associated development, or private land development but has substantial influence on lynx through vegetation management actions on National Forests.

Since 2000, the Forests have managed lynx habitat under existing Forest Plans as implemented through the Conservation Agreements, described earlier. This management has benefited lynx habitat during that time. Few of the factors listed above have resulted in adverse effects to lynx or lynx habitat on Forest Service lands, as the Conservation Agreements required deferral of projects that were likely to adversely affect lynx.

EFFECTS OF THE ACTION

This section includes an analysis of the direct and indirect effects of the proposed action on the species. Direct effects are impacts on species that occur at the same time and place as the action and are caused by the action. Indirect effects are impacts caused by or resulting from actions of specific projects, but they occur later in time and are reasonably certain to occur.

The Forest Service proposes to amend the eight Plans within the SRLA area to include lynx conservation measures. Our 2000 biological opinion concluded that if Plans were amended or revised with the conservation measures in the LCAS, or an equivalent thereof, then the Plans would not likely jeopardize lynx. The proposed amendment would incorporate the primary benefits of the LCAS conservation measures into management direction. However, the Forest Service proposes to change some of the restrictions on activities in lynx habitat compared to the LCAS management standards analyzed in the 2000 biological opinion. In some cases, standards were changed to guidelines because the Forest Service considers guidelines more appropriate for those risk factors that the Service determined were not negatively affecting the contiguous U.S. DPS as a whole (68 FR 40076), because that level of constraint [implied by standards] is unwarranted (R. Smith, pers. comm. 2006 *in* NRLA BO). Further, in some cases limited scientific or other information indicated standards were needed in most cases to avoid adverse effects to lynx or lynx habitat. Guidelines would be implemented in most cases (Forest Service 2008) and where not adhered to for compelling reasons, adverse effects to lynx are not necessarily inevitable. Thus, this analysis will highlight differences in LCAS direction (as analyzed in the 2000 biological opinion) and the direction contained in the proposed action, and concentrate on the effects related to those differences.

The Forest Service (2008) based effects determinations on what the Plans permit or prohibit, as well as, when information was available, a quantitative assessment of the effects to lynx of actions that had the most potential to negatively affect lynx. Information included estimated projections of future actions, as well as projected or needed funding in comparison to past funding. The Forest Service analyzed what the proposed action would allow and what was anticipated to occur. However, many actions that are allowed and projected may not actually occur. For instance, many Plans allow timber harvest. However, timber harvest levels on Federal land across the western United States had declined consistently and dramatically (approximately 80 percent) over past decades or longer, even though Plans allowed more harvest (R. Gay, U.S. Forest Service, in litt. 1999 *in* U.S. Fish and Wildlife Service 2000). The same trend holds in forest types that provide lynx habitat (B. Bollenbacher, U.S. Forest Service, in litt. 1999; B. Ferguson, U.S. Forest Service, pers. comm. 1999 *in* NRLA BO; F.

Zenson, U.S. Forest Service, pers. comm. 1999 *in* NRLA BO; B. Short, U.S. Forest Service, in litt. 1999; all *in* U.S. Fish and Wildlife Service 2000). Forest Service Plans allow, but do not necessarily direct, actions to occur. Many activities that are allowed by the current and proposed Plans are never fully carried out for a variety of reasons, such as funding limitations and environmental or policy considerations. The BA (Forest Service 2008) provided details on likely scenarios for future actions, given the expectations for future funding. Future implementation of the Plans as currently written is partly dependent on political, economic, and local considerations.

Another factor considered in this effects analysis was our limited knowledge of some areas of lynx ecology specific to the contiguous United States. Some uncertainty exists regarding the level and type of effects that land use management decisions at both project and programmatic levels may have on the contiguous United States lynx DPS. We observe that researchers have suggested that land management Plans should thus be conservative in their retention of known important lynx habitat components (McKelvey et al. 2000a).

Between 1998 and 2000, in the face of these uncertainties and knowledge gaps, the Service, Forest Service, BLM, and the National Park Service accumulated available information on lynx through development of the Science Team Report and the LCAS. These efforts demonstrate a commitment by the Federal action agencies to cooperate to improve knowledge of lynx ecology. Since the LCAS was written, additional information became available regarding lynx, snowshoe hares, and their habitat. Ongoing research efforts should provide additional lynx and lynx habitat information in the near future. If research or other efforts provide information that reveals effects to the species not considered in this biological opinion, additional consultation may be required (50 CFR 402.16).

The BA (Forest Service 2008) indicates the importance of the LCAS for guiding management of lynx habitat on Federal lands. Since issuance of the LCAS in 2000, additional research and information has become available to inform our management of lynx habitat. Appendix C of the BA lists available lynx research information for the United States, including that in progress or completed after 2000. While still a relevant source of information, as noted earlier, the 2000 LCAS is being updated and clarified with this information and additional information as it becomes available (James Claar, U.S. Forest Service pers. comm. 2006 *in* NRLA BO). We used the LCAS and research and information from before and after 2000 to develop this opinion, depending upon its relevance, status and availability.

Assumptions in the Forest Service's Biological Assessment

The Forest Service analyzed the effects of its proposed action based on several assumptions. Two factors weigh heavily into the effects analysis in this biological opinion. These are: 1) the analysis of effects is primarily based on projections of changes in future Forest Service activities resulting from the proposed standards and guidelines; and 2) the assumption that

the Forest Plans will be followed except where compelling reasons, such as the protection of other species at risk or protection of public safety, are an issue.

The proposed action would add or modify management direction in existing Plans and would consist of one or more of the following:

- *Goals,* which are general descriptions of desired results;
- *Objectives,* which are descriptions of desired resource conditions;
- *Standards,* which are management requirements designed to meet the objectives; and
- *Guidelines,* which are management actions normally taken to meet the objectives.

As did the Forest Service in its BA (Forest Service 2008), we will also assume that guidelines will be followed unless such compelling reasons exist. If this assumption is determined to be incorrect as projects and second tier consultations proceed, consultation on the Plans may need to be reinitiated to determine whether this assumption resulted in additional effects to lynx that were not considered and analyzed in this biological opinion (50 CFR 402.16).

Analysis of Effects by Land Management Allocation

In the SRLA area, 32 percent of all NFS acres of lynx habitat are in non-developmental management area allocations. Most of these "non-developmental allocation" lands are in wilderness areas, research natural areas, and other similar allocations that generally have minimal impacts from human activities. Incorporation of the lynx conservation measures into the SRLA Forest Plans would result in little or no change in current management direction for non-developmental areas, with the exception of possibly allowing fire to play more of a natural role in these areas. Changes to lynx and lynx habitat would be negligible because these resource values are already being addressed by current Forest Plan direction, with the possible exception of fire management. The LCAS objective of allowing fire to play its natural role as a disturbance process, which could create younger successional stages of forested stands in a natural mosaic, may benefit lynx habitat long term.

Twenty-four percent of all NFS lands in mapped lynx habitat in the SRLA area are in developmental management area allocations in which potential impacts from management activities are low to moderate (Forest Service 2008). These lands include allocations for special interest areas, backcountry uses, scenic rivers and byways, a variety of dispersed recreation uses, municipal watersheds, and corridors connecting core areas. The proposal to incorporate lynx conservation measures into SRLA Forest Plans may not change the existing level of activities in these management areas, but may limit increases of winter dispersed recreational activities into currently unused areas. Standards and guidelines associated with the maintenance of lynx habitat, the competitive advantage of lynx, and habitat connectivity could affect specific locations, distribution, and timing of some activities. Therefore, implementation of the proposed action would emphasize conservation actions that provide greater benefit (e.g., connectivity, reduced road mortality) to lynx and lynx habitat within these management area allocations than the current direction in the Forest Plans.

Forty-four percent of all NFS lands in mapped lynx habitat in the SRLA area are in developmental management area allocations managed for a full range of multiple use activities. The proposal to incorporate lynx conservation measures into Amendment Area Forest Plans would have the greatest potential to reduce or remove risks to lynx and lynx habitat identified in the LCAS and Final Rule on these land allocations. These lands probably also provide the greatest opportunity to maintain or increase lynx foraging habitat through vegetation manipulation and other land management activities.

Analysis of Effects by Primary Areas of Concern

The following sections analyze the effects of the measures in the proposed action on lynx, by primary areas of concern.

Habitat Connectivity. Incorporating the standard **ALL S1** would address the impacts to lynx from loss of connectivity within the SRLA area. This standard requires that new or expanded permanent developments and vegetation management projects in a LAU or linkage area maintain habitat connectivity. Thus, under this standard, Forest Service actions will not be permitted to degrade connectivity in lynx habitat or in linkage areas. The Forest Service has also incorporated objectives, standards and guidelines for management direction to improve connectivity (**LINK 01, S1, G1** and **G2**, and **HU O6, G3, G6, G7**).

The direction in the proposed action is consistent with recommendations in the LCAS. Many actions that affect connectivity in or between blocks of lynx habitat are primarily conducted under the authority of other agencies, such as highway departments, or private landowners. The proposed direction promotes maintenance and improvements in connectivity to the extent that the Forest Service has authority to influence or control actions that affect connectivity. There may be instances where Forest Service actions, such as permitting the expansion of ski areas, result in indirect adverse effects on connectivity for individual lynx, due to associated development on private lands.

The objectives, standards and guidelines described above would reduce or minimize the potential for adverse effects to lynx in most cases, and the Plans would ultimately conserve connectivity within lynx habitat. Therefore, the proposed action, related to effects on connectivity, would not contribute to appreciably diminishing survival or recovery of lynx within lynx habitat in the SRLA area as a result of activities authorized by the Forest Service. The specific effects of these types of projects would be analyzed during project-specific consultation.

Vegetation Management (including Timber Harvest and Management, Fuels Treatment, and Salvage Harvest). The primary factors driving lynx populations, behavior and distribution is the abundance and distribution of their primary prey, snowshoe hare. As noted earlier, vegetation management, natural fire, and insects can set back vegetation succession to an early seral stage, which may be used by hares during the summer but is snow-covered and thus unavailable to hares during the winter. Ruediger (et al. 2000) defines this early seral

condition as "lynx habitat in unsuitable condition." However, eventually these stands regenerate and provide high stem densities and horizontal structure extending above snowpack during the winter, and become high quality snowshoe hare habitat. High quality lynx habitat contains an abundance of this early successional habitat (up to 30 percent of an LAU) within a mosaic of mid- to late-seral stands. For purposes of this document, "stand initiation structural stage" is synonymous with "lynx habitat in unsuitable condition" (as used in the LCAS). Forest stands are considered to have returned to a suitable condition (i.e., grown beyond the stand initiation structural stage) when the trees reach above the average winter snow level and provide forage and cover to snowshoe hare during winter months. Older forested stands also contain high quality winter habitat when they have multi-story structure that provides forage and horizontal cover for both lynx and snowshoe hare (Murray et al. 1994).

The Forest Service has identified four objectives related to vegetation management that would improve the quality of lynx habitat by improving conditions for prey: 1) manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx (**VEG O1**); 2) provide a mosaic of habitat conditions through time that support dense horizontal cover and high densities of snowshoe hare, and provide winter snowshoe hare habitat in both the stand initiation structural stage and in the mature, multi-story conifer vegetation (**VEG O2**); 3) conduct fire use activities to restore ecological processes and maintain or improve lynx habitat (**VEG O3**); and 4) focus vegetation management in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover (**VEG O4**).

Standards **VEG S1, VEG S2, VEG S5, and VEG S6** are designed to meet the objectives above by ensuring that enough habitat is available within each LAU to provide lynx with sufficient foraging habitat to maintain productivity. The direction for **VEG S1** and **S2** is consistent with the LCAS. Under **VEG S1**, the majority of the lynx habitat in the action area (97 percent) would be managed so that LAUs would have no more than 30 percent of area in the stand initiation structural stage. Fuel treatment projects may not result in more than 3 adjacent LAUs exceeding the **VEG S1** standard. Additionally, under **VEG S2**, the majority of the lynx habitat in the action area (97 percent) would be managed such that timber management will not "regenerate" (i.e., change to stand initiation structural stage) more than 15 percent of lynx habitat in an LAU in a 10-year period. Calculation of this 15 percent requirement includes the entire acreage within stand-replacing even-age regeneration treatments, and only the patch opening acreages within group selection treatments. Salvage harvest within stands killed by insect epidemics, wildfire, etc., does not add to the 15 percent, unless the harvest treatment would cause the lynx habitat to change to an unsuitable condition (i.e., stand initiation structural stage).

It is important to note that stand initiation structural stages are considered acceptable if they occur in less than or equal to 30 percent of an LAU. These young stands typically contain high stem densities and horizontal cover, which provides summer habitat and eventually

grows into essential mid-to-later seral winter foraging habitat for lynx. The 30 percent per LAU limit on stand initiation stage habitat and the 15 percent limit per decade would promote a mosaic of young and older stands within each LAU (see section below on *Exemptions and Exceptions to Vegetation Standards for Fuels Management and Pre-commercial Thinning*).

Standard **VEG S5** further ensures that high quality snowshoe and lynx habitat is maintained by deferring pre-commercial thinning practices and similar activities intended to reduce seedling/sapling density during the stand initiation structural stage until the stand no longer provides winter snowshoe hare habitat. This standard protects and maintains the high stem densities that provide high quality snowshoe hare forage during both summer and winter seasons. Thinning reduces horizontal cover that is critical to maintain the snowshoe hare prey base. Reducing dense horizontal structure through silvicultural thinning would likely reduce an area's carrying capacity for snowshoe hares (Ruggiero et al. 2000). In the southern portion of the range of lynx in the contiguous United States, lynx populations appear to be naturally limited by the availability of snowshoe hare prey, as evidenced by large home range size, high kitten mortality due to starvation, and greater reliance on alternate prey (Aubry et al. 2000). Deferring thinning in young dense conifer stands until they reach older age classes maintains the inherent capacity of the habitat to support snowshoe hares (see section below on *Exemptions and Exceptions to Vegetation Standards for Fuels Management and Pre-commercial Thinning*).

Standard **VEG S6** similarly conserves lynx habitat by limiting vegetation management actions that reduce snowshoe hare habitat in multi-storied mature or late successional conifer forests. This standard represents an important conservation measure in addition to those in the LCAS. Standard **VEG S6** was based in part on recent information gained through on-going research within the Northern Rockies (Squires et al. 2006) and Southern Rockies (Shenk 2007) that was not available during development of the original LCAS. Our assumption regarding this standard is as follows: **VEG S6** generally limits vegetation management treatments that reduce snowshoe hare habitat within multi-story stands that contain dense horizontal cover. Recognizing that vegetative structure within a stand may not be uniform throughout, uneven aged management techniques will be used to open up the canopy within those portions of a stand that lack dense horizontal cover to allow understory vegetation to regenerate. We further assume that, in general, those portions of the stand that contain dense horizontal cover will receive only limited treatments (generally anticipated to be no more than 1 percent of dense horizontal cover per Forest). We recognize that some incidental impacts will occur to portions of the stand containing dense horizontal cover (see **Exception 4** below).

Lynx preferentially forage in spruce-fir forests with high horizontal cover, abundant hares, deep snow, and large-diameter trees during the winter (Squires et al. 2006). High horizontal cover found in multistory conifer stands was a major factor affecting winter hare densities (Hodges 2000a, b *in* Squires et al. 2006). During winter, snowshoe hares were consistently found in multi-storied forest stands. These older, multi-storied stands provide forage, hiding

cover, and likely thermal cover for both snowshoe hares and lynx. This new standard is a significant improvement in conserving lynx in addition to the vegetation management measures in the earlier LCAS (see section below on *Exemptions and Exceptions to Vegetation Standards for Fuels Management and Pre-commercial Thinning*).

Guideline **VEG G1** is consistent with the LCAS and directs that vegetation management projects recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available, and that management will be focused on those stands that currently are not providing snowshoe hare habitat (e.g., mature monotypic lodgepole pine stands) for the purpose of enhancing habitat for lynx and their prey. Guideline **VEG G11** directs that denning habitat be distributed in each LAU in the form of large amounts of woody debris and, if the denning habitat appears to be lacking (e.g., less than 10 percent denning habitat per LAU), then projects should be designed to retain coarse woody debris or residual trees for future denning habitat. **VEG G5** directs that habitat for alternate prey species, primarily red squirrel, should be provided in each LAU.

VEG S1, S2, S5 and S6 and **VEG G1, G5, and G11** would work together to promote vegetation management objectives. Based on the best available information, the Service concludes that combined, this direction would conserve the essential components of lynx habitat: a mosaic of early, mature and late successional forests, with high levels of horizontal cover and structure. These components ensure habitat that maintains its inherent capability to support snowshoe hare and lynx during all seasons. These standards are required for all vegetation management actions on at least 95.5 percent of lynx habitat within the SRLA area. Where these standards are applied to vegetation management projects, we anticipate few projects, if any, would have adverse effects on lynx. Collectively, application of these standards for vegetation management is expected to avoid adverse effects to lynx and promote the survival and recovery of lynx populations.

Exemptions and Exceptions to Vegetation Standards for Fuels Management and Pre-commercial Thinning

The proposed action includes exemptions from Standards **VEG S1, S2, S5, or S6** to allow for fuels management with the WUI. The proposed action also includes exceptions listed in **VEG S5 and S6** that allow for some additional vegetation treatments, either within or outside of WUI areas, for the purposes of protecting structures, for research, for promoting conservation of aspen, for incidental removal of trees during salvage harvest, and for some additional pre-commercial thinning.

Exemptions to **VEG S1, S2, S5 or S6**

Under the proposed action, fuels treatment projects within the WUI that do not meet standards **VEG S1, S2, S5, or S6** shall occur on no more than 3 percent (cumulatively) of lynx habitat on each administrative unit (i.e., a National Forest or administratively combined National Forests). While these exemptions do provide some flexibility with Standards **VEG**

S1, S2, S5, and S6, an additional guideline, **VEG G10**, directs that the intent of the exemptions is still to follow **VEG S1, S2, S5, and S6** as much as possible. **VEG G10** states that "fuel treatment projects within the WUI as defined by HFRA should be designed considering Standards **VEG S1, S2, S5, and S6** to promote lynx conservation."

Therefore, under the exemption to **VEG S1**, fuels reduction projects in the WUI can result in more than 30 percent of an LAU in the stand initiation structural stage as long as these projects cumulatively occur on no more than 3 percent of the lynx habitat per Forest and result in no more than 3 adjacent LAUs exceeding the standard (i.e., no more than 3 adjacent LAUs can have more than 30 percent of the LAU in the stand initiation structural stage).

Under the exemption to **VEG S2**, fuels reduction projects in the WUI can result in more than 15 percent of the lynx habitat per LAU being regenerated in a 10-year period as long as these projects cumulatively occur on no more than 3 percent of the lynx habitat per Forest. Note that this standard specifies regeneration treatments. Regeneration harvests are the cutting of trees that create a new age class and the major methods of regeneration harvests are clear cutting, seed tree, shelterwood, and group selection cuts. Therefore, fuels reduction projects in the form of tree thinning, which do not create a new age class, would not count towards the 15 percent limit while group selection patch cuts would count towards the 15 percent limit.

Under the exemption to **VEG S5**, fuels reduction projects in the WUI in the form of pre-commercial thinning would be allowed in all age classes of lynx habitat as long as these projects cumulatively occur on no more than 3 percent of the lynx habitat per Forest. Pre-commercial thinning projects include thinning practices and similar activities that are intended to reduce seedling/saplings densities. Pre-commercial thinning that occurs outside the WUI is not exempt from **VEG S5** and can occur only 1) in stands that no longer provide winter snowshoe hare habitat, or 2) in accordance with the conditions of **Exception 5 in VEG S5** (see discussion below).

Under the exemption to **VEG S6**, fuels reduction projects in the WUI that reduce snowshoe hare habitat in multi-story mature or late successional conifer forests can occur as long as these projects cumulatively occur on no more than 3 percent of the lynx habitat per Forest. Vegetation management projects that reduce snowshoe hare habitat in multi-story mature or late successional conifer forests in areas outside the WUI may only occur in accordance with the conditions of the exceptions to **VEG S6** (see discussion below).

Where exemptions from **VEG S1, S2, S5, or S6** are used, fuels reduction treatments are likely to be in the form of fuel breaks and removal of small diameter trees. Lynx would likely be adversely affected through a reduction in the quality and productivity of lynx and snowshoe hare habitat, mainly from the removal of horizontal cover, for at least 10 to 15 years, depending upon location, until treated stands regenerate to provide winter snowshoe hare habitat. Further, depending upon the fuel loading, location and funding, these stands

may be treated again to retain them as fuel breaks and thinned stands and may not be allowed to regenerate, thus extending the length of time they remain in early seral conditions.

Current research suggests such thinning in hare habitat results in a corresponding decrease in the abundance of snowshoe hares (see Ruggiero et al. 2000). Similarly, the exemption for fuel management from **VEG S6** would allow management actions in the WUI that would reduce the horizontal cover and overstory, and thus the quality of snowshoe hare habitat, in older, multi-layered stands. These older stands are important as foraging habitat for lynx and for hares (Squires et al. 2006), especially during the winter months. Exemptions in both **VEG S5** and **S6** may reduce the capacity of an LAU to support lynx reproduction and/or occupancy and may translate to a low level of impairment of reproduction and feeding during some years. Specifically, we anticipate that some adult female lynx within home ranges affected by such projects may fail to complete a pregnancy or would be less successful in finding adequate food resources needed to ensure maximum survival potential for kittens. Thus, we expect reproductive impairment and kitten survival to be impacted. The impact would depend upon the size of the treated area as well as the inherent capacity of the site to support snowshoe hares.

Exceptions to **VEG S5 and VEG S6**

In addition to the exemptions in the proposed action, Standards **VEG S5 and S6** also contain exceptions for some additional vegetation treatments that include pre-commercial thinning and treatments in multi-story mature or late successional conifer forests. Activities allowed under these exceptions may occur either within or outside the WUI areas. Collectively, the total area that could be impacted by exceptions to **VEG S5 and S6** (excluding **Exception 5 in VEG S5** and **Exception 4 in VEG S6**) would affect no more than 0.5 percent (37,886 acres) of lynx habitat in the SRLA area. **Exception 5 in VEG S5** would result in pre-commercial thinning on no more than 1 percent of lynx habitat per LAU (75,771 acres cumulatively throughout the SRLA area). **Exception 4 in VEG S6 is** generally not anticipated to result in take, given the guidelines for this exception. In the event that take is anticipated in future projects, those effects will be addressed in a second tier biological opinion, as needed.

Exceptions to **VEG S5** allow for: pre-commercial thinning projects within 200 feet of administrative sites, dwellings, or buildings **(Exception 1)**; pre-commercial thinning projects for the purposes of research studies or genetic tree tests that evaluate genetically-improved reforestation stock **(Exception 2)**; pre-commercial thinning projects that remove conifer in aspen stands, or as daylight thinning around individual aspen trees, where aspen is in decline **(Exception 3).** Specific to **Exception 3 in VEG S5**, aspen is considered to be in decline where evidence suggests that aspen has been reduced from its historic proportion of the landscape. Evidence of decline includes nearby applicable research or studies; comparison of historical and recent aerial photographs; numerous stands with dead or dying mature aspen with little or no aspen regeneration, etc., and; **Exception 4**) allows for pre-commercial thinning projects that, based on new, peer-reviewed information, would "not likely adversely

affect" lynx, or would have only short-term adverse effects and long-term beneficial effects to lynx and its habitat. Projects allowed under **Exception 4** must be accepted by regional/state levels of the Forest Service and the Service and must include a written determination from the Service

Exception 5 in VEG S5 allows for additional pre-commercial thinning (above and beyond the 3 percent limitations for fuels projects within the WUI) provided that: a) the additional thinning does not exceed 1 percent of the lynx habitat in any LAU for the life of the amendment; b) pre-commercial thinning in LAUs with more than 30 percent in the stand initiation structural stage is limited to areas that do not yet provide winter snowshoe hare habitat; c) projects are designed to maintain lynx habitat connectivity and snowshoe hare habitat over the long term; and d) monitoring is used to determine snowshoe hare response. This exception may occur either within or outside of WUI areas. Pre-commercial thinning treatments in 1 percent of the lynx habitat per LAU could affect approximately 75,771 acres cumulatively throughout the SRLA area, although the Forest Service estimates the area treated is likely to be lower (25,650 acres), based on availability of funding and historical amounts of pre-commercial thinning (Forest Service 2008). This exception is most likely to result in treatments in early seral stands of lodgepole pine and, through its reduction in horizontal cover, is expected to reduce winter snowshoe hare habitat. Although pre-commercial thinning under this exception is limited to 1 percent of the lynx habitat per LAU for the life of the amendment and treatments may be well distributed throughout the SRLA area, this exception may result in adverse effects at the LAU scale, especially where this exception is used for treatments within LAUs that do not meet **VEG S1 or VEG S2**. For those LAUs that have already exceeded Standard **VEG S1**, the proposed action specifies that pre-commercial thinning in lynx habitat will only be allowed in areas that do not provide winter snowshoe hare habitat yet.

Exceptions to **VEG S6** allow for vegetation management projects that reduce snowshoe hare habitat in multi-story mature or late successional conifer forests: within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special use improvements, including infrastructure within permitted ski area boundaries (**Exception 1**); for the purposes of research studies or genetic tree tests that evaluate genetically-improved reforestation stock **(Exception 2);** as a result of incidental removal during salvage harvest, such as from a skid trail **(Exception 3)**.

The impacts to lynx habitat from salvage harvests will differ depending on whether the stand was killed by a fire event or by an insect epidemic. Salvage harvest of a forest stand affected by fire depends on the severity of the fire, such that a moderate-to-high severity fire often kills most of the overstory and understory vegetation while a low-severity fire results in a mosaic of live and dead patches of trees. Therefore, a stand killed by a moderate-to-high severity fire will likely have generally no live overstory and understory vegetation and a salvage harvest will have little effect on the current lynx habitat at that site, although other impacts to the site may result from the harvest, such as soil erosion, soil compaction, etc. By contrast, an insect epidemic in lynx habitat from the mountain pine beetle typically results in

the loss of the mature overstory in lodgepole pine stands, but typically does not kill the understory vegetation, if present. Therefore, a salvage harvest in a stand affected by mountain pine beetle has the potential to damage some understory vegetation as a result of incidental damage (e.g., heavy machinery) when the dead overstory trees are removed. Salvage harvest in a spruce-fir stand affected by spruce beetle may result in incidental damage to live mature subalpine fir trees and understory vegetation when the mature dead spruce trees are removed. Damage to understory vegetation with dense horizontal cover reduces snowshoe hare habitat. Impacts to dense horizontal cover are limited by **VEG S2**, which states that timber management projects shall not regenerate more than 15 percent of lynx habitat on NFS lands within an LAU in a ten-year period, and are also limited by **VEG S1** and **VEG S6**. There are no restrictions as a result of the amendment on salvage harvest in stands in which both the overstory and understory vegetation are already dead or where no understory was present.

Exception 4 in VEG S6 allows for vegetation management projects that reduce snowshoe hare habitat in multi-story mature or late successional conifer as a result of uneven-aged management (single tree and small group selection) practices that are employed to maintain and encourage multi-story attributes as part of gap dynamics. Small group selection will consist of small-sized forest openings (approximately 1-2 acres). Openings created by group selection will not exceed 20 percent of a stand in a single entry, but individual tree selection can occur throughout an entire stand or between the groups. Project design must be consistent with **VEG 01, 02, and 04**, except where impacts to areas of dense horizontal cover are incidental to activities under this exemption (e.g., construction of skid trails). Therefore, uneven-aged treatments will mimic or approximate natural succession and disturbance processes while maintaining and providing habitat conditions that support lynx and snowshoe hare through time in both the stand initiation structural stage and in mature, multi-story conifer vegetation (**VEG 01 and 02**). Additionally, uneven-aged treatments will be focused in areas that have the potential to improve winter snowshoe hare habitat but presently have poorly-developed understories that lack dense horizontal cover (**VEG 04**). The amount of lynx habitat that can be treated under **Exception 4 in VEG S6** is limited by **VEG S1 and S2.** Only the even-aged regeneration areas and the patch openings within group selections count towards the regeneration treatments tracked under **VEG S1 and S2**; individual tree removal does not count towards the regeneration totals. Salvage harvest does not count towards the regeneration total unless the harvest treatment would cause the lynx habitat to change to a stand initiation structural stage.

In summary, the exceptions under **VEG S5** would allow for vegetation treatments that are likely to have adverse effects on lynx through the reduction in the horizontal structure of natural forest succession phases, although the impacts would depend upon the size of the treated area as well as the inherent capacity of the site to support snowshoe hares. **Exceptions 1, 2 and 3** under **VEG S6** allow for vegetation treatments that may have adverse effects in the short term by affecting the mosaics of the forested landscape in localized areas, although these treatments are expected to maintain and enhance lynx habitat in the long term by encouraging a mosaic of multi-storied stands. **Exception 4 in VEG S6** is generally not

anticipated to result in take, given the guidelines for this exception. In the event that take is anticipated in future projects, those effects will be addressed in a second tier biological opinion, as needed. With each subsequent second tier biological opinion, the cumulative total of incidental take exempted would be tracked along with all other exempted take.

The total area that could be impacted by the exemptions to **VEG S1, S2, S5, or S6** (which allow up to 3 percent of the lynx habitat per Forest to be treated within WUI areas), is approximately 227,315 acres of lynx habitat distributed spatially and temporally in the SRLA area. However, the actual amount that may be treated is expected to be lower, based on estimates of fuels treatments in the SRLA area over the past 5 years and funding projections (Forest Service 2008). Additionally, the total area that could be impacted by exceptions to **VEG S5 and S6** (excluding **Exception 5 in VEG S5** and **Exception 4 in VEG S6**) would affect no more than 0.5 percent (37,886 acres) of lynx habitat distributed spatially and temporally in the SRLA area. **Exception 5 in VEG S5** would result in pre-commercial thinning on no more than 1 percent of lynx habitat per LAU (75,771 acres distributed spatially and temporally throughout the SRLA area). Table 3 provides the acres of treatments that would be allowed per Forest under the exemptions and exceptions to **VEG S1, S2, S5, or S6**. Due to budget and funding limitations, the Forest Service anticipates that the treatments will generally be implemented throughout the lifespan of the amendment (15 years), rather than concentrated in a short time period (J. Grode, pers. comm. 2008).

Table 3. Acres of Treatment per Forest under Exemptions and Exceptions to VEG S1, S2, S5 or S6.

National Forest	Total NFS Lynx habitat Acres	Acres of Treatment in WUIs under Exemptions to VEG S1, S2, S5, or S6 (3% of Lynx Habitat)	Acres of Treatment under Exceptions 1-4 in VEG S5 and Exceptions 1-3 in VEG S6 (0.5% of Lynx Habitat)	Acres of Treatment under Exception 5 in VEG S5 (1% of Lynx Habitat per LAU)[1]	Acres of Total Treatment under Exemptions and Exceptions to VEG S1, S2, S5, or S6 (4.5% of Lynx Habitat)
Arapaho-Roosevelt	690,082	20,702	3,450	6,900	31,054
GMUG	1,641,664	49,250	8,208	16,416	73,875
Medicine Bow/Routt	1,192,466	35,774	5,962	11,924	53,661
Pike-San Isabel	826,156	24,785	4,131	8,261	37,177
Rio Grande	1,035,420	31,063	5,177	10,354	46,593
San Juan	1,048,567	31,457	5,243	10,485	47,186
White River	1,142,794	34,284	5,714	11,427	51,426
Total:	7,577,149	227,315	37,885	75,771	340,972

1 - Although acres are presented per Forest in this table, actual amounts of pre-commercial thinning will be limited to 1 percent of lynx habitat per LAU.

Compared to the baseline condition (i.e., current Plan management under the Conservation Agreements), the proposed action with its exemptions and exceptions allows for more treatments in lynx habitat that may result in adverse effects. However, the proposed action would continue to preclude pre-commercial thinning and understory removal in the majority (95.5 percent) of lynx habitat within the action area and, thereby, reduce the potential for degradation of existing snowshoe hare habitat. Another difference between the proposed action and the baseline condition is the addition of **VEG S6,** which is a new standard designed to conserve multi-storied stands and which represents a substantial improvement over the baseline condition, existing Plans, and recommendations in the original (2000) LCAS. **VEG S6** was not a standard included in the 2000 LCAS and is based on recent research efforts on use of habitat by lynx (Squires et al. 2006). This standard will further retain and promote important lynx habitat components, foraging and denning habitat.

Actions conducted under exemptions and exceptions would be distributed among the seven individual National Forests with over 7,577,149 acres of lynx habitat across the SRLA area. Adverse effects, while possible, are likely to affect only portions of any individual lynx home range. If acres of these treatments were concentrated in an area, the effects to individual lynx may be more significant, but would affect fewer lynx. This effect will be minimized by Standard **VEG S1** under which fuel treatment projects may not result in more than 3 adjacent LAUs exceeding 30 percent of lynx habitat in the stand initiation structural stage. Under the proposed action, vegetation treatments that adversely affect the essential components of lynx habitat would not be allowed in 95.5 percent of lynx habitat in the SRLA area. The proposed management would allow for the action area as a whole to serve its role in the conservation of lynx by maintaining its inherent capacity to provide a prey base and foraging habitat for a breeding population of lynx and by maintaining connectivity for lynx movement within home ranges and dispersal.

Fire Management. The direction and intent in the LCAS for wildland fire management is well represented in the proposed action. The amendment clarifies that vegetation management objectives **VEG O1, O2,** and **O4,** and **VEG O3** (specific to fire use) remain unchanged from current management. All are consistent with the direction in the LCAS to restore fire as a natural ecological process in lynx habitat and are attained through application of the vegetation management standards and guidelines described earlier. Specific to fire management, **VEG 03** specifies that fire use activities should be conducted to restore ecological processes and to maintain or improve lynx habitat. Also, **VEG G4** directs that prescribed fire activities should not create permanent travel routes that facilitate snow compaction, and that construction of permanent firebreaks on ridges and saddles should be avoided.

The objectives for vegetation management would provide guidance to allow fire to contribute to sustaining snowshoe hare habitat within lynx habitat, and would improve the reproduction, numbers, and distribution of lynx in the SRLA area. Thus, the objectives would avoid an appreciable reduction in the reproduction, numbers and distribution within the SRLA area from fire management activities. Within non-developmental land allocations (32 percent of

lynx habitat in the SRLA area) (see Table 2), natural processes are expected to predominate. In these areas, fire would continue to play a significant role in creating natural mosaics of vegetation valuable to lynx.

Landscape Patterns. In general, the proposed action would promote forested landscape patterns that maintain or restore lynx habitat. This positive effect would occur everywhere except in lands associated with the fuel and vegetation management exemptions, generally in WUI areas. The direction in the LCAS for landscape patterns is well represented in the proposed vegetation management objectives. Vegetation management objectives **VEG O1, O2, O3** and **O4** are all consistent with the direction in the LCAS. These objectives are attained through application of the vegetation management standards and guidelines, which limit vegetation management activities that have the potential to adversely affect important components of lynx and snowshoe hare habitat. The wide-spread application of these measures would provide sufficient habitat to sustain lynx populations in the SRLA area. Although the exceptions and exemptions to vegetation guidance may result in adverse effects to individual lynx (as detailed earlier), vegetation objectives, standards and guidelines implemented in 95.5 percent of lynx habitat within the SRLA area would create and maintain landscape patterns that sustain snowshoe hare and lynx populations, thus on the whole would avoid an appreciable reduction in the reproduction, numbers, and distribution of lynx in the SRLA area. Additionally, the **VEG S1** standard, under which fuel treatment projects may not result in more than 3 adjacent LAUs exceeding 30 percent of lynx habitat in the stand initiation structural stage, should further maintain a distribution of lynx habitat within the SRLA area.

Denning Habitat. The common component of denning habitat appears to be large amounts of coarse woody debris (Koehler 1990; Staples 1995). This structure is most valuable when distributed throughout the home range, in or near foraging habitat. The proposed action may result in localized effects to the quality and quantity of denning habitat, mostly through fuels management activities and salvage and timber harvests that remove existing coarse woody material. Lynx denning sites are not believed to be a limiting factor in Montana and Maine study areas (J. Squires, pers. comm. *in* NRLA BA; M. McCollough, pers. comm. 2007 *in* NRLA BO) and similarly, are not believed to be a limiting factor in the SRLA area (K. Broderdorp, pers. comm.. 2007). Further, earlier assessments concluded that in most geographic areas, denning habitat was not likely limiting to lynx, and existing Plan direction would not result in adverse effects (Hickenbottom et al. 1999). The best information suggests that Forest Service management conducted under current Plans has resulted in conditions that provide adequate denning habitat. Since finalization of the 2000 LCAS, studies in the United States have shown that lynx use a variety of sites and stand types for denning. The consistent element present at den sites is dense cover typically provided by downed wood and/or debris. These habitat elements are generally found distributed across National Forests. Within non-developmental land allocations (e.g., wilderness, roadless, late successional reserves), denning habitat would likely be maintained at or above levels that occurred historically. Thus, only in exceptional circumstances would an LAU lack denning habitat.

Similarly, we do not anticipate that vegetation management under the proposed action would result in a lack of denning habitat within an LAU. The Forest Service proposes to minimize the potential for lack of adequate denning habitat through **VEG G11,** which condenses the direction found in two LCAS standards and three guidelines for retention of denning habitat into a less prescriptive guideline specific to denning habitat. In summary, **VEG G11** directs that denning habitat should be distributed in each LAU, and if denning habitat appears to be lacking (i.e., less than 10 percent per LAU), then projects should be designed to retain coarse woody debris that would provide future denning habitat. Further, **VEG G1**, which specifies that vegetation management practices should be designed to recruit dense vegetation in areas where habitat is scarce or not available, is similar to that recommended in the LCAS, but has changed from a standard to a guideline. Objectives **VEG O1, O2, O3, and O4** and implementing standards **VEG S1, S2, and S6**, also indirectly promote the development and retention of the structure needed for denning habitat, through vegetation management that promotes a mosaic of stand types distributed across the landscape. We would like to note that while salvage and timber activities often retain some coarse woody debris, the practice of removing limbs from these logs, typically for the purpose of lowering the fire risk, reduces the ability to create piles of overlapping logs (i.e., jackstraw) that provide denning habitat.

In most cases, denning habitat is not known to be limited within lynx habitat on Federal lands within the SRLA area, and the vegetation management objectives, standards and guidelines either directly or indirectly promote the development and retention of adequate amounts of denning habitat. Therefore, projects are unlikely to reduce denning structure to levels that result in adverse effects to lynx. In the infrequent cases where denning habitat is limited in an LAU, or projects would result in substantial reduction of denning structure, **VEG G11** would be followed in most cases. The number of projects leading to adverse effects on lynx due to lack of denning habitat is expected to be very few. Sustaining lynx populations on the whole would avoid an appreciable reduction in the reproduction, numbers, and distribution of lynx in the SRLA area.

Habitat Conversions. The proposed action includes objectives similar to those recommended in the LCAS to reduce the potential for adverse effects to lynx from habitat conversion. Vegetation management objectives **VEG O1, O2, O3** and **O4** are all consistent with the intent of objectives in the LCAS to minimize habitat conversions. The LCAS did not contain standards or guidelines specific to habitat conversions. The LCAS objectives were to be attained through application of the vegetation management standards and guidelines, similar to the direction in the proposed action. With the application of these measures, we anticipate that the proposed action would limit adverse affects to lynx via habitat conversions within the SRLA area. Attainment of the vegetation management objectives through projects designed using vegetation management standards and guidelines would support lynx survival and recovery.

Forest Roads. Lynx are known to have been killed by vehicle-collisions in Colorado, Minnesota, Maine, New York and Idaho. High traffic volumes and speed may impede or create barriers to lynx movement, and may increase the likelihood of lynx mortality through

vehicle collision. Appendix A provides unpublished data regarding road kill mortality of lynx (primarily since the listing) within the U.S. This information suggests that even where traffic volume and speeds may be considered low, mortality of lynx on any road within the action area is possible. Although recent evidence has surfaced (See Appendix A) documenting lynx mortality on similar types of roads elsewhere in the U.S., we are not aware of any incident where a lynx has been killed by vehicle collision on roads managed by the Forest Service in the SRLA area.

Recreational, administrative, and commercial uses of Forest roads are known to disturb many species of wildlife (Ruediger 1996). However, preliminary information suggests that lynx do not avoid roads (Ruggiero et al. 2000), except at high traffic volumes (Apps 2000). Unlike paved highways, Forest roads rarely receive motorized use at levels that create barriers or impediments to lynx movements. We believe that lynx mortality on Forest roads from vehicle strikes are less likely, due primarily to the relatively slow speeds at which vehicles on these roads travel (due to topography and road conditions) and generally low traffic volumes. Lynx have been documented using less-traveled roadbeds for travel and foraging (Parker 1981; Koehler and Brittell 1990). Lynx show no preference or avoidance of unpaved Forest roads, and the existing road density does not appear to affect lynx habitat selection (McKelvey et al. 2000c). Most investigations indicate that lynx do not alter their behavior to avoid human activities (Staples 1995; Roe et al. 1999; Aubry et al. 2000; Mowat et al. 2000; J. Squires, pers. comm. 2006 *in* NRLA BA). Human access via Forest roads can increase the potential for mortality or injury of lynx captured incidentally in traps aimed at other species or through illegal shooting. Trapping is not allowed in Colorado, but it is in Wyoming. Road densities may contribute to this factor. National Forests have road density standards for various resource objectives and roads are not present in roadless and wilderness areas.

The proposed action includes an objective and several guidelines related to addressing potential impacts of Forest roads. **HU 06** directs that adverse effect of highways can be reduced by working cooperatively with other agencies to provide for lynx movement and habitat connectivity, and to reduce lynx mortality. The guidelines address issues of upgrading, habitat connectivity, and brush removal. Most of the LCAS guidelines have been retained in the amendment, **HU G6, G7, and G8,** with modifications of guideline **HU G9**. Under the current management, guideline **HU G9** directs that new roads built for project-specific activities should restrict public motorized use. Under the proposed action, guideline **HU G9** directs that public motorized use of new roads built for project-specific activities should be restricted if a project-level analysis determines that the new road adversely affects lynx. Therefore, the proposed action may allow for some new project-specific roads to receive public motorized use if the Forest Service determines that the impacts to lynx will be insignificant and discountable. With both the current management and the proposed action, these roads should be reclaimed or decommissioned if not necessary for other management objectives. Within linkage areas, Standard **LINK S1** specifies that potential highway crossings will be identified when highway or Forest highway construction or reconstruction is proposed in linkage areas.

At the time of the 2000 BO, Forest roads were thought to possibly impact lynx due to the potential that snow compaction could allow lynx competitors into deep snow habitats. Thus, the one LCAS standard pertaining to Forest roads focused on snow compaction. However, research, including research conducted within the NRLA area, has provided no conclusive evidence that snow compacted routes adversely affect lynx or their habitats. Therefore, this LCAS road standard has been changed to a guideline (**HU G10**), and is discussed later in this biological opinion (see section on *Winter Dispersed Recreation*).

In summary, the amendment retained the road management guidance recommended in the LCAS to reduce the potential effects of roads on lynx. The objectives and guidelines reduce or minimize the impacts of Forest roads on lynx and would avoid appreciable reductions in the reproduction, numbers, and distribution of lynx within the SRLA area.

Developed Recreation. Developed recreation can result in direct loss of lynx habitat and associated development of the surrounding area. Large developed sites, such as four-season resorts, alter lynx habitat, result in direct loss of lynx habitat on the footprint of the development itself, and may fragment the landscape, depending upon size and location. Within Colorado, at least 8 of the 34 lynx linkages contain a ski area directly within the linkage zone. Resort developments result in permanent loss of lynx habitat through the development of permanently groomed runs and resort infrastructure, such as lift termini, buildings and roads. Potential lynx habitat within resorts receives very high levels of use by people, which likely reduces use by lynx. Collectively, ski resorts currently directly impact only a small proportion of lynx habitat. A total of 82,704 acres (1.1 percent of lynx habitat in SRLA area) are permitted for ski areas in the SRLA area by the Forest Service. While a breakdown of this amount into habitat and non-habitat was not available, it is assumed that the majority of these acres contain lynx habitat, although some non-habitat would be present in alpine areas (i.e., above treeline) (J. Grode, pers. comm. 2007). While some loss of lynx habitat is unavoidable due to development, a relatively small area is affected when considered at a Forest or larger scale.

The most serious impact of ski or four-season resort development is the associated private land development at the base, with resulting increases in highway traffic, speeds, and surrounding development. Such development can impact connectivity between areas of lynx habitat, typically valley bottoms between mountain ridges. Lynx may avoid areas with concentrated housing, roads, highways, and business parks. Increased traffic volume, within lynx habitat or the landscape linkages, may result in additional fragmentation of habitat and may result in reduced connectivity and a higher likelihood of mortality on highways within the action area.

Most investigations indicate that lynx do not alter their behavior to avoid human activities (Staples 1995; Roe et al. 1999; Aubry et al. 2000; Mowat et al. 2000). However, some exceptions are activities that "would cause abandonment of a den site, possibly affecting kitten survival" (Ruggiero et al. 2000) and those that result in significant increases in traffic volume. Lynx are known to move kittens from natal to rearing den sites, sometimes moving

kittens several times during rearing. Further, if an area was disturbed to levels that impact lynx denning, it is unlikely lynx would select the site for denning in following years.

We anticipate that the proposed action related to developed recreation would limit some adverse effects to lynx. The direction and intent of the LCAS regarding developed recreation is well represented in the amendment. The proposed action retained LCAS objectives and standards that address the most serious consequence of development, requiring new or expanding permanent developments to maintain or, where possible, promote habitat connectivity within LAUs and linkage areas (**All O1, All S1, LINK O1, and LINK S1**). The proposed amendment retained LCAS guidelines to further promote connectivity when constructing or reconstructing highways or Forest highways (**All G1**). Further, the proposed amendment retained several guidelines that reduce impacts within the development itself, including: adequately sized inter-trail islands that support winter snowshoe hare habitat (**HU G1**), providing foraging opportunities for lynx that are consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands of coniferous forest across mountain slopes (**HU G2**), and providing for lynx movement and maintenance of the effectiveness of lynx habitat (**HU G3**). These guidelines were not changed from those in the LCAS. Although the LCAS included a standard for maintaining and providing diurnal security habitat, there is no evidence that diurnal security habitat is required by lynx or, where it occurs on ski areas, is used by lynx.

With the application of these objectives, standards and guidelines, we anticipate that many adverse effects on lynx from future developed recreation would be minimized under the proposed action. Based on evidence suggesting lynx are fairly tolerant of human activity (e.g., Roe et al.1999), some use of large ski areas, or immediately adjacent areas, by lynx may be possible. If lynx use is precluded by habitat alteration or excessively high levels of human activities, standard **ALL S1** addresses the most significant adverse effect of developed recreation on lynx populations by directing that new or expanded permanent developments and vegetation management practices and activities must maintain habitat connectivity in an LAU and/or linkage area. Neither the LCAS nor the proposed action prohibits the development of recreation sites on National Forest lands, therefore individual lynx may be adversely affected by developed recreation through habitat avoidance, alteration or loss, and increased traffic volume. Where expansions develop substantial amounts of habitat outside the existing footprint of development, adverse effects through habitat loss are expected. Although individual lynx may be adversely affected by recreation development actions, these objectives, standards, and guidelines as a whole would reduce potential future project impacts and overall impacts at a landscape scale, and thus would avoid an appreciable reduction in the reproduction, numbers, and distribution of lynx in the SRLA area.

Non-winter Dispersed Recreation. Due to the low susceptibility of lynx to displacement by humans, this activity presents low risk of adverse effects, except possibly for disturbance near den sites. Because Plans in the SRLA area generally already provide for adequate and widely distributed denning habitat (Hickenbottom et al. 1999), no adverse effects were identified related to non-winter dispersed recreation. Dispersed recreation often occurs along

hiking trails through forested areas and well-used, if not designated camp sites. Human-created disturbance near such areas is fairly predictable and if disturbance occurred at levels affecting lynx or their dens, it is unlikely that lynx would den near such established sites. Further, lynx could move their kittens to an alternate site and/or would likely avoid denning in these areas in following years. Lynx den sites are not easily detected in forests and unlikely to be noticed by recreationists. The likelihood that dispersed recreation on or off trails would occur in proximity to a den site, and/or that the dispersed recreation activities occurring would actually disturb a lynx den site or, in other ways, adversely affect lynx is so low as to be discountable. Further, the intent of the LCAS standard to ensure landscape connectivity is found in the proposed action in **All O1** and **All S1.** In summary, non-winter dispersed recreation activities are not likely to adversely impact lynx, nor result in adverse impacts to the lynx population in the SRLA area.

Winter Dispersed Recreation. Dispersed winter recreational uses and activities, such as snowmobiling, cross-country skiing, and snowshoeing are increasing within higher elevation environments. These activities are unlikely to have direct adverse effects on lynx, "but are more likely to impart indirect effects." (Ruediger et al. 2000). Most investigations indicate that lynx do not alter their behavior to avoid human activities (Staples 1995; Roe et al. 1999; Aubry et al. 2000; Mowat et al. 2000). However, understanding of the indirect effects is imprecise. Individuals of the species may react differently depending on numerous factors involving human interaction.

The range of lynx and coyotes overlap in many regions of Canada and the United States. The range of lynx is restricted to forested areas with deep snow conditions during the winter. Morphologically, lynx are well-adapted to hunting snowshoe hares in deep snow (Murray and Boutin 1991) in densely forested environments as they have very large feet in relation to body mass, which prevents them from sinking deep into snow. Coyotes are at a disadvantage while hunting in high snow areas, as their feet are fairly small in relation to body mass and they therefore sink into soft snow (Murray and Boutin 1991). Some researchers hypothesized that the presence of compacted snowmobile trails may allow coyotes to access lynx habitat from which they were previously excluded by deep, unconsolidated snow, which may negate the competitive advantages of lynx over coyotes and other predators during the winter (Buskirk et al. 2000, Murray and Boutin 1991, Bunnell et al. 2006). Research documents that coyotes use compacted snow routes and scavenge for carrion, and/or prey on snowshoe hare and other small mammals during the winter (Kolbe et al.2007; Shirley 2005; Staples 1995).

Dietary and habitat-use overlap may influence competition between predators. As in many areas across the range of lynx, lynx in the Southern Rockies prey almost exclusively on hares in the winter and so a significant depletion of hares by coyotes during winter could adversely affect lynx (Kolbe et al.2007). Squires and Ruggiero (2007) noted that the lynx use of alternate prey may increase as hares become scarce, but not at the hare densities they observed during 1998 to 2002. In the United States, snowshoe hare habitat becomes more fragmented as habitats becomes drier, and thus hare densities are significantly lower than in

Canada. Hodges (2000b) reports that hares may be cyclic in southern areas, although may have peak and low densities lower than those in the north. Thus, snowshoe hare densities are relatively and consistently lower across lynx range in the United States, including the SRLA area. Coyotes are known as generalist predators, using a diverse selection of mostly small mammal prey, as well as carrion. Where hares are abundant, hares may also be a primary component of coyotes' diet (Mowat et al. 2000).

Bunnell et al. (2006) indicated that snow compacted routes increased coyote presence in their study areas in Utah and Wyoming, thereby suggesting that compacted routes would increase coyotes' competition with lynx for snowshoe hare if lynx were present. They also concluded that "restrictions placed on snowmobiles in lynx conservation areas by land management agencies because of the potential impacts of coyotes may be appropriate." However, in northwestern Montana, Kolbe et al. (2007) concluded there is "little evidence that compacted snowmobile trails either facilitated coyote movements on our study area or that snowshoe hares provided a large proportion of the coyote's winter diet. It is unlikely that compacted snowmobile trails increased exploitation competition between coyotes and lynx during winter on our study area." Kolbe et al. (2007) suggested that compacted snow routes did not appear to enhance coyotes' access to lynx and hare habitat, and so would not significantly affect competition for snowshoe hare. They found that coyotes used compacted snow routes for less than eight percent of travel, suggesting normal winter snow conditions allowed access by coyotes, regardless of the presence or absence of compacted snow routes. Bunnell et al. (2006) indicated that "circumstantial evidence" suggested the existence of competition. Kolbe was able to directly measure relationships between coyotes, compacted snow routes and snowshoe hare in an area that also supports a lynx population. Coyote diet was made up of large portions of carrion (over 60 percent) scavenged mostly along or near trails in the Uinta Mountains in Utah (Shirley et al. 2005), and similarly mostly ungulate carrion (over 60 percent) but not nearer to trails than expected in Montana (Kolbe et al. 2007). Analyses of coyote scat in each study area also revealed similar amounts of snowshoe hare (about 16 and 12 percent, respectively).

The ecology of multi-species predator and prey relationships across the range of the boreal forest is complex. Even with high or complete overlap in resource use, recent models of competition have suggested that species may coexist for long periods of time (MacNalley 1995 *in* Mowat et al. 2000). No research to date has documented a decline in lynx populations due to competition by coyotes. Further, the degree to which coyotes and lynx compete for snowshoe hares in the western United States is unknown (Kolbe et al. 2007). The impact of competition by coyotes on lynx populations is probably influenced by many variables, including snowshoe hare abundance, alternate prey species, alternate prey abundance, availability of carrion, and several habitat variables including quality of snowshoe hare habitat, the extent of forest openings, and winter snow conditions over time.

To date, research has confirmed that lynx and coyote populations coexist, despite dietary overlap and competition for snowshoe hare and alternate prey species. In some regions and studies, coyotes were found to use supportive snow conditions more than expected, but none

confirm a resulting adverse impact on lynx populations in the area. In our final rule (March 24, 2000; 65 FR 16052), snow compaction created by human activities was not found to be a threat to the lynx DPS. In our 2000 and 2003 finding, we concluded there is no evidence that any competition may exist between lynx and other species that exerts a population-level impact on lynx. We also have no evidence that packed snow trails facilitated competition to a level that negatively affects lynx or lynx populations. However, extensive compacted conditions, in some situations, may result in the breakdown of the competitive advantage that lynx usually retain in deep snow environments. Widespread compaction of snow within a large portion of a lynx home range may result in adverse effects to lynx if the home range is functionally incapable of supporting lynx.

The proposed action includes an objective (**HU O1**) to maintain the lynx's natural competitive advantage over other predators in deep snow by discouraging the expansion of snow-compacting activities in lynx habitat. The proposed action changes an LCAS standard for no net increase in compacted snow routes, unless it consolidates use, to a guideline stating that "compacted-snow areas should not expand outside baseline areas of consistent snow compaction, unless designation serves to consolidate use and improve lynx habitat" (**HU G10**). This measure directly addresses the hypothesis that the area impacted by coyotes (or other competitors) in deep-snow areas is related to the spatial arrangement of compacted snow routes. The guideline would reduce the potential for significant increases in the area influenced by compacted snow routes. Similar to the direction in the LCAS, the proposed action would continue to limit the expansion of winter dispersed recreation activities within lynx habitat. Currently, there are 4,825 miles of compacted routes and trails within the SRLA area (J. Grode, pers. comm. 2007). Guideline **HU G10** does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access related to **HU G12**. Guideline **HU G12** limits winter access for non-recreational special uses and mineral and energy exploration and development to designated routes. Finally, the proposed action requires mapping and monitoring of snow compacting activities and designated and groomed routes at five-year intervals.

The Service concludes that the proposed guideline would be sufficient to maintain habitat effectiveness for lynx by limiting the expansion of compacted snow routes, and our conclusion would be tested through monitoring required in the Plans. The best information available has not indicated that compacted snow routes increase competition from other species to levels that adversely impact lynx populations, and under the proposed action, the amount of areas affected by snow compacted routes within the SRLA area would not substantially increase. Thus, the proposed action would allow projects that may adversely affect individual lynx in some specific cases. However the proposed action as a whole would avoid appreciable reductions in the reproduction, numbers, and distribution of lynx in the SRLA area. In the event that take is anticipated in future projects, those effects will be addressed in a second tier biological opinion, as needed. With each subsequent second tier biological opinion, the cumulative total of incidental take exempted would be tracked along with all other exempted take.

Minerals and Energy. Mining and energy development may directly impact lynx habitat. New development can result in localized losses of lynx and snowshoe hare habitat and can attract dispersed recreational activity (primarily snow compacting activities) into certain areas. As described earlier, the promotion of recreational activities is unlikely to adversely affect lynx. The proposed action contains the following three guidelines that would minimize the potential impacts of mineral development on lynx by specifying that management should reduce impacts on lynx and lynx habitat through reclamation of closed sites and facilities (**HU G5**), and should encourage remote monitoring to reduce snow compaction (**HU G4**). These guidelines have not changed from the LCAS. An LCAS standard that limits winter access to designated routes was changed to a guideline (**HU G12**), as described in the previous section. The direction and intent in the LCAS is well represented in the proposed action. With the application of these measures, the proposed action would result in no or only minor adverse effects to lynx, depending upon the scale of development and potential loss of habitat. Therefore, the effects of minerals and energy development across the SRLA area would not appreciably reduce reproduction, numbers, and distribution of lynx.

Habitat Connectivity. Because lynx have large home ranges and can move long distances, coordination among different land management agencies is important to the recovery of lynx. Connected forest habitats allow lynx to move long distances to find food, cover, and mates. Without coordination, the effects of highways and mixed land ownership patterns on lynx are likely to contribute to increased mortality on highways and reductions in habitat connectivity. Although the proposed action has measures to directly address coordination (coordination is already required under existing Forest management direction), the Forest Service is a lead member in the interagency Lynx Steering Committee and the Lynx Biology Team, and played a key coordination role for the Lynx Science Team.

With the large amount of lynx habitat in the action area, the Forest Service has the ability to impact connectivity in the future through the proposed action. The proposed action includes measures that would address the habitat connectivity issue by requiring new or expanded permanent developments and vegetation management projects to maintain connectivity in LAUs and linkage areas through standard **All S1**, and by identifying potential highway crossings when highway or Forest highway construction or reconstruction is proposed in linkage areas through standard **LINK S1**. This direction was present in the LCAS, and to that end, the Forest Service led and completed an interagency effort that resulted in a map of potential lynx linkage areas for the SRLA area. This map was produced in 2002 by a team of representatives from Federal, State, and tribal agencies.

Livestock. Snowshoe hare densities and overwinter survival appear to be positively correlated with understory density (Adams 1959, Wolff 1980, Litvaitis et al. 1985). Livestock may compete with snowshoe hares for forage resources (Ruediger et al. 2000). Browsing or grazing also could impact plant communities that connect patches of lynx habitat within a home range. Conversely, appropriate grazing management can rejuvenate and increase forage and browse in key habitats such as riparian areas. However, we found no

evidence that grazing was a factor threatening lynx; therefore, grazing was not addressed in the final listing rule (March 24, 2000; 65 FR 16052). No evidence exists of lynx being adversely affected by grazing within the SRLA area or elsewhere, or of lynx movements within home ranges being impeded by grazing practices. Given the previous discussion of lynx dispersal movements, it is unlikely that grazing would impede lynx movements for dispersal or breeding. Accordingly, the proposed action changes LCAS grazing standards to guidelines. The proposed action would continue to reduce the potential for grazing to adversely affect lynx through guidelines for grazing management practices that provide for the regeneration of trees, shrubs and aspen clones in lynx habitat. These guidelines, formerly LCAS standards, should adequately minimize the potential for adverse effects of grazing to lynx: manage livestock grazing to allow regeneration in fire- and harvest-created openings (**GRAZ G1**); contribute to the long-term health and sustainability of aspen (**GRAZ G2**); maintain or achieve a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes in riparian areas and willow carrs (**GRAZ G3**); and contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes in shrub-steppe habitats (**GRAZ G4**). With the application of these measures in most cases, the proposed action would result in no effects or discountable effects to lynx as a result of grazing. Therefore, effects of grazing across the SRLA area would be minimal and would not appreciably reduce reproduction, numbers, and distribution of lynx in the SRLA area.

Effects of the Proposed Action in Relationship to Recovery

The recovery outline is clear in its emphasis on the need to manage lynx habitat within core areas to support recovery of lynx in the DPS. Focusing lynx conservation efforts on core areas will ensure the continued persistence of lynx in the contiguous United States. Only the core areas currently have a clear role in recovery (lynx recovery outline); the secondary and peripheral areas may be important for periodic population expansion and connectivity. The recovery outline identifies four recovery objectives. Below, we analyze the extent to which the proposed action addresses the recovery objectives:

Objective 1: Retain adequate habitat of sufficient quality to support the long-term persistence of lynx populations within each of the identified core areas.

To summarize, we conclude that the proposed action fulfills this objective and adequately manages the provisional core area of the SRLA area. In support of Objective 1, the proposed amendment includes the following direction for the SRLA area:

1) The proposed action includes vegetation management objectives that support this recovery objective, as detailed earlier (**VEG O1, O2, O3, and O4**).
2) The proposed action would maintain a mosaic of early to late forest successional stages necessary to support snowshoe hare and lynx. No more than 30 percent of lynx habitat within an LAU would be in the stand initiation structural phase (**VEG**

S1), and no more than 15 percent of lynx habitat in any LAU could be changed (harvested) to this stage per decade (**VEG S2**), except for exemptions to **VEG S1 and S2** for fuels projects in WUI areas.

3) The proposed action would sustain snowshoe hare winter forage habitat in either stand initiation structural stage (early successional stages) or in older, mature multistoried stands (**VEG S5 and S6**) in at least 95.5 percent of lynx habitat in the action area.
4) Where fuels treatment actions are planned in WUI areas, **VEG S1, S2, S5, and S6** will be considered in designing treatments to reduce adverse effects to lynx (**VEG G10**).
5) Exemptions to standards that avoid adverse effects to lynx habitat are limited to fuel reduction treatments within the WUI and would affect no more than 3 percent of lynx habitat per Forest within the SRLA area. It is unlikely that 3 percent of the lynx habitat per Forest would be treated, or that all treatments would adversely affect lynx. Collectively, these actions will not occur on more than 3 percent (227,315 acres) of the SRLA area.
6) Exceptions to standards that avoid adverse effects to lynx habitat are limited to only those circumstances listed under **VEG S5 and S6**. Collectively, these actions will not occur on more than 1.5 percent (113,657 acres) of the SRLA area.
7) A number of vegetation management guidelines (**VEG G1, G4, and G11**), as described earlier in this biological opinion, would further reduce the potential for adverse effects.
8) Approximately one-third (32 percent) of all lynx habitat within the SRLA area is in a non-developmental status where natural ecological processes are expected to predominate.
9) The Forest Service is a lead agency in the multi-agency Lynx/Wolverine Steering Committee, and the National Lynx Biology Team. Although they are not a part of the proposed action, these teams help develop relationships with non-Federal land management agencies and private land owners, including the States, and provide a source for non-Federal land management options through the LCAS.

Thus, we conclude that the proposed action contributes to this recovery objective, in part.

Objective 2: Ensure that sufficient habitat is available to accommodate the long-term persistence of immigration and emigration between each core area and adjacent populations in Canada or secondary areas in the United States.

To summarize, we conclude that the proposed action contributes to this recovery objective in part, although we have concerns related to continued connectivity within the SRMGA, and between the Southern Rockies and the Northern Rockies.

1) The proposed action includes objectives to use Federal jurisdiction to actively maintain or restore lynx habitat connectivity in and between linkage areas and LAUs, either through Federal land management or conservation easements, land exchanges,

or other cooperative efforts with private land owners (**All O1, Link O1**). The proposed action contains a standard that applies to all programs requiring new or expanded developments and vegetation management projects to maintain habitat connectivity within LAUs and linkage areas (**ALL S1**). The proposed action also includes a standard that requires the Forest Service to identify potential linkage across highways proposed for construction or reconstruction (**LINK S1**). Therefore, the proposed action meets the recovery objective of accommodating long-term connectivity across these broad areas.

2) Overall, Forest Service vegetation management under the proposed action would not preclude connectivity. Fuels treatment projects in lynx habitat would degrade no more than 3 percent of all lynx habitat (inside the WUI) on any Forest and pre-commercial thinning would degrade no more than an additional 1 percent of lynx habitat per LAU, either outside or within the WUI. Additionally, fuels treatment projects in WUIs may not result in more than 3 adjacent LAUs exceeding the standard.
3) Development is another key factor that may impede lynx movement. As detailed earlier, although the existing ski areas in the SRLA area in general affect only minor amounts of lynx habitat (less than one percent), many of the downhill ski area are arrayed along the I-70 highway corridor. The combination of ski areas, high-speed and high-volume highways, and private development are considered to impede the connectivity of lynx habitat in the central area of Colorado.
4) As explained earlier in this opinion, dispersing lynx use a wider variety of habitats and prey resources compared to lynx attempting to establish a home range and territory. A number of lynx from the reintroduced population in Colorado have dispersed to Wyoming, Utah, Idaho, Montana, New Mexico, Arizona, and South Dakota (T. Shenk, pers. comm. 2007), traveling as far as 1220 kilometers, measured as a straight-line distance. Most of the lynx that were either recaptured or retrieved (carcasses) were in good body condition. Some of these lynx evidently crossed the Red Desert region of Wyoming (K. Broderdorp, U.S. Fish and Wildlife Service, pers. comm. 2007). However, it should be noted that no recent evidence suggests that emigration from other core areas into the Southern Rocky Mountains has occurred. It is reasonable to predict that some of those eventually located in Montana or Idaho dispersed across unoccupied secondary areas. Individual lynx also would likely be able to occupy these secondary areas, but at low densities.
5) Non-Federal lands also contain lynx habitat. Although not a part of this proposed action, the Forest Service is a lead agency in the multi-agency Lynx/Wolverine Steering Committee, and National Lynx Biologist's Team. These efforts facilitate relationships with other Federal and non-Federal land managers, including the States, and provide a source for non-Federal land management guidance, through products such as the LCAS and Forest Plans. The Steering Committee would also provide a forum to build and sustain cooperative efforts with Canada to maintain lynx habitat connectivity across the international border, if and when the need arises.

Thus, we conclude that the proposed action contributes to this recovery objective, in part.

Objective 3: Ensure that habitat in secondary areas remains available for continued occupancy by lynx.

The entire SRLA area is considered to be a provisional core area and does not contain any secondary area; this objective does not apply to the SRLA.

Objective 4: Ensure that threats have been addressed so that lynx populations will persist in the contiguous United States for at least the next 100 years.

Although the Plans do not apply for 100 years and thus cannot directly fulfill this objective, the proposed action would allow lynx populations to persist on Federal lands in the action area within the foreseeable future. The proposed amendments address the threat to the DPS, inadequate regulatory measures, within lynx habitat in the SRLA area by limiting, reducing or avoiding the major adverse impacts of Federal land management on lynx, as well as several other potential impacts or influences that do not rise to the level of a threat to the DPS. Further, approximately one-third (32 percent) of the lynx habitat within the SRLA area remains in non-developmental status where natural ecological processes predominate.

Summary of the Effects of the Proposed Action

The Forest Service designed the proposed action to address those risk factors to lynx evaluated in the LCAS that were relevant in terms of Forest Plan direction. The LCAS incorporated a comprehensive amount of information, including information contained in the Science Report and other available information on lynx and forest management activities, in the development of risk factors and conservation measures. In the 2000 BO, we determined that if Plans were amended or revised to include the conservation measures in the LCAS, or an equivalent, Plans would provide substantive and measurable direction for the management of lynx habitat and would reduce or avoid the potential for adverse effects on lynx. At that time, the LCAS (along with the Science Report) represented the best information regarding Forest Plan direction and lynx. The BA (Forest Service 2008) and this biological opinion considered the information, objectives, standards and guidelines in the LCAS, but also new information relevant to assessing the proposed action's impacts on lynx and lynx habitat.

We have determined that the proposed Plan amendments would incorporate the substantial and relevant conservation measures in the LCAS, or the equivalent thereof, as modified with updated information or clarified for amendment purposes. The proposed amendment includes protective measures for lynx and, as such, is an improvement over the direction found in the existing Forest Plans, other than those recently revised. (The White River Plan was revised in 2002, and the Medicine Bow Plan was revised in 2003). However, since 2000, the Forest Service has been managing its lands consistent with the Conservation Agreements (U.S. Forest Service and U.S. Fish and Wildlife Service 2005 and 2006), which required deferring most projects that adversely affect lynx until Plans were amended to conserve lynx overall. The proposed action amends the Plans to conserve lynx and lynx

habitat overall, but would allow some projects with adverse effects to lynx to proceed. Therefore, the proposed action is likely to result in adverse effects to individual lynx at higher levels than what has occurred during the past six years under the Conservation Agreements, while providing for the overall conservation of the species at a landscape level.

The majority of adverse effects to lynx from the proposed action would come from fuels management projects within as much as 3 percent of lynx habitat in the action area (within the WUI) and, to a lesser extent (up to 1.5 percent of lynx habitat) from other vegetation management for other resource benefits. A limited number of actions where third parties are involved, such as ski area expansions and development, may also have adverse effects on lynx under the proposed action. Effects from such actions will be addressed in future second tier biological opinions as needed. With each subsequent second tier biological opinion, the cumulative total of incidental take exempted would be tracked along with all other exempted take. The amendment would not change the level of effects from these types of actions involving third parties during interim management over the past six years, because the Conservation Agreements did not require deferral of projects involving third parties.

Overall, the proposed action would reduce or avoid the potential for adverse effects in lynx habitat over the direction in the existing Forest Plans. The benefits of the proposed action to lynx come primarily from the incorporation of vegetation management objectives and implementing standards **ALL S1, VEG S1, S2, S5, and S6**, and others into the Plans. This suite of objectives, standards, and guidelines clearly conserve snowshoe hare and lynx habitat on an ecosystem scale in the SRLA area. Lynx are dependent on their primary prey, snowshoe hare, which are in turn dependent on early and late seral vegetation conditions. Thus, we consider proper vegetation management on Federal lands of primary importance to lynx populations, especially given that the preponderance of lynx habitat occurs on National Forest lands. Many activities, other than vegetation management, authorized by Forests have relatively minor or less substantial impacts on lynx. Although a variety of activities that might result in disturbance to lynx are allowed under the Plans, such as road use or recreation, most investigations indicate that lynx do not significantly alter their behavior to avoid human activities (Staples 1995; Roe et al. 1999; Aubry et al. 2000; Mowat et al. 2000). The best information suggests that the main influence that Forest Service forest management has on lynx comes from actions that impact snowshoe hare numbers through vegetation management and actions that impact lynx habitat connectivity.

Effects of Plans in Areas Outside of Lynx Habitat

The objectives, standards, and guidelines in the proposed action designed to benefit lynx generally apply only in lynx habitat on National Forest System lands within LAUs, with exceptions such as recommendations pertaining to connectivity (i.e., linkages). However, the administrative units within the SRLA area typically encompass lands that provide lynx habitat and also lands that are not considered lynx habitat. Thus, the Plans being analyzed here affect both lynx habitat and areas without lynx habitat.

Lynx are known to occur outside lynx habitat in anomalous habitats adjacent to, as well as, far from primary lynx habitat (McKelvey et al. 2000b). We fully expect that lynx will occasionally use habitats outside lynx habitat. Based on our examination of the risk factors to lynx, the analysis in the BA (Forest Service 2008), the information in the LCAS and Science Report, as well as other information in our files, we conclude that the current direction in programmatic Forest Service Plans for lands outside of lynx habitat is not likely to adversely affect lynx for the following reasons:

1. In the contiguous United States, the distribution of lynx is associated with southern boreal forests that receive deep snow conditions and support their primary prey, the snowshoe hare (Ruggiero et al. 2000; 70 FR 68294, November 9, 2005). The proposed amendments focus on maintaining and improving prey populations within lynx habitat. Lynx habitat within the range of the DPS is typically comprised of those vegetation associations that support the highest numbers of snowshoe hares. Habitats outside lynx habitat generally do not have inherent potential to produce snowshoe hares at densities that would support lynx residency and reproduction. Alternate prey species are important to lynx in the southern periphery of their range. However, available evidence suggests that lynx populations are not likely to persist where snowshoe hares do not predominate in the diet (Ruggiero et al. 2000).

2. Given the best information available, we are able to reasonably define and map lynx habitats, based on—(a) lynx research from Canada and Alaska (Mowat et al. 2000), (b) lynx research in Colorado, Montana, Washington, and Wyoming (Shenk 2006; Koehler and Brittell 1990; McKelvey et al. 2000c; Squires and Laurion 2000; Squires et al. 2006), (c) relationships between lynx occurrence records and vegetation types in the contiguous United States (McKelvey et al. 2000b), (d) trapping data, (e) knowledge about prey species (Hodges 2000b; Squires et al. 2006), (f) knowledge about prey abundance and lynx population responses (Dolbeer and Clark 1975; McKelvey et al. 2000b; Ruggiero et al. 2000; Mowat et al. 2000), (g) knowledge regarding lynx response to human activities (Staples 1995; Aubry et al. 2000; Ruggiero et al. 2000) and (h) local site-specific analyses (Shenk 2006). Extensive effort has been expended to accumulate and interpret existing knowledge of lynx and their habitats, culminating with publication of the Science Report and LCAS. Lynx occurrence records in the 20th century correspond with our current biological understanding of lynx habitat in the contiguous United States (McKelvey et al. 2000b).

3. We know and expect that lynx will occur outside of lynx habitat types. We conclude, based on but not limited to the research information detailed in (2) above, that these occurrences represent—(a) lynx that are dispersing to lynx habitat elsewhere, (b) lynx that are on relatively short exploratory movements near or adjacent to lynx habitat and will ultimately return to lynx habitat, or (c) individuals that have emigrated from lynx habitat due to prey species declines and ultimately will not successfully establish home ranges and reproduce, and may succumb to starvation for lack of prey.

4. We concur with the direction of the proposed action to focus habitat management efforts in lynx habitat, which supports resident populations and contributes to the long-term conservation of lynx.

5. The proposed action also provides direction for additional important non-lynx habitats such as landscape linkage areas, which likely provide connectivity and opportunistic foraging habitats for lynx. Thus connectivity issues are addressed to the extent the Forest Service has jurisdiction or authority.

Species Response to Proposed Action

Lynx populations occur at naturally low densities in the contiguous United States, largely due to inherently low densities of snowshoe hares, their primary prey (Aubrey et al. 2000). Low snowshoe hare densities are likely a result of the naturally fragmented boreal habitat at southern latitudes (including the SRLA area) that prevents hare populations from achieving densities similar to those in the extensive northern boreal forest of Canada. Rarity of lynx does not necessarily mean that management actions have or will cause population reductions. At the same time, rarity and large home ranges makes it essential to develop and apply broad, landscape-level approaches that ensure the adequate and appropriate analyses of potential management impacts and the development of effective lynx conservation measures.

With the proposed lynx amendments, the Plans will provide this landscape approach to lynx management. The incorporation of the proposed management direction over the large geographic area in the SRLA area in lynx habitat within seven National Forests (7.6 million acres) contributes to the landscape level direction necessary for the survival and recovery of lynx in the Southern Rockies ecosystem.

Federal land management assumes the largest single role in the conservation of the lynx in the contiguous United States because of the preponderance of lynx habitat types on Federal lands, particularly in the western United States. We conclude that it is imperative that lynx habitat and habitat for lynx prey be maintained and conserved on Federal lands.

In the final rule, we concluded that at present time, the contiguous United States lynx DPS does not appear to be threatened by destruction, modification, or curtailment of its habitat or range. However, under current Plans, a large proportion of Federal land remains subject to management under developmental allocations. Current land management Plans allow management activities that could result in substantial degradation of lynx habitat that could affect productivity, availability, juxtaposition, and connectivity of habitat components at a large scale. This proposed action addresses that risk by creating regulatory mechanisms that will reduce or eliminate those risks within the SRLA area through vegetation and linkage/connectivity standards.

Past analyses (Hickenbottom et al. 1999; U.S. Fish and Wildlife Service 2000) demonstrated that the existing Plans would likely result in adverse effects to lynx, based on 15 different

criteria related to the impacts of various Federal land management programs and activities on lynx. The proposed action ameliorates, to a great extent, the adverse effects of the Plans in lynx habitat by requiring that actions proposed by the Forest Service be designed considering lynx conservation through application of objectives, standards and guidelines. Further, the proposed action substantially implements the intent and direction in the LCAS, modified with new information and review, which was designed to provide programmatic guidance and to guide project planning to avoid adverse effects to lynx (Ruediger et al. 2000). The proposed action includes objectives, standards, and guidelines for appropriate design of, or limits on, projects that the best information and research indicate have the most serious consequences for lynx, namely management actions that reduce snowshoe hare numbers through habitat alteration.

Based on our review of the LCAS and new information, the Service concludes that most actions in lynx habitat that are in compliance with the proposed action would either have no effect on lynx or would not likely adversely affect lynx. The most significant exceptions to this include fuels management and pre-commercial thinning, activities exempted and excepted from the standards under special circumstances that are limited to no more than 4.5 percent of lynx habitat in the SRLA area. The proposed action also limits the level of adverse effects that are unavoidable with certain other actions, such as recreation developments. Further, we conclude that changing some of the standards contained in the LCAS to guidelines does not necessarily increase the likelihood that actions would adversely affect lynx. Guidelines would be implemented in most cases (Forest Service 2008) and adverse effects would not always occur where guidelines were not implemented. Effects would be based on site-specific conditions and would require subsequent project level (Tier 2) consultation with the Service. Thus, we do not expect that adverse effects would reach levels that impact lynx populations as a result of changing LCAS standards to guidelines for this amendment. The Forest Service changed standards to guidelines mostly based on our finding that the actions did not pose threats to the DPS, and upon review of past and new research information. Our positions were based on the lack of conclusive or reliable information that supported that such actions or activities were exerting negative impacts on the DPS. Thus, changes from standards in the LCAS to guidelines in the amendment occurred when the best available information indicated that the action was not likely to adversely affect lynx, or not likely to adversely affect lynx in most cases (i.e., where no conclusive or reliable information supported the standard in the LCAS). Application of the proposed standards and, for the most part, guidelines would substantively reduce the potential for adverse effects on lynx over the existing Plans.

We conclude, based on our entire analysis, that the proposed action would support lynx populations in the SRLA area and would not appreciably reduce the reproduction, numbers or distribution of lynx in the SRLA area. The recovery outline for lynx (U.S. Fish and Wildlife Service 2005) presents our current understanding of historical and current lynx distribution, ecology, population dynamics, and the relative importance of different areas to the persistence of lynx in the contiguous United States. We have determined that the proposed action is compatible with our understanding of recovery needs for lynx in the

contiguous United States DPS. As analyzed in this opinion, the proposed action addresses, in whole or in part, each of the applicable objectives in the recovery outline for lynx.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Portions of private lands, especially those above 8,000 feet in elevation, are likely in potential lynx habitat and may be subject to timber harvest and thinning. Other smaller parcels of private lands will be primarily used for residential areas, or may be used for small scale forestry, or will be developed for business uses in the future.

In addition to timber management, activities on non-Federal lands may include mineral extraction, oil and gas exploration, urban and rural development, recreation site construction and use, road construction, and utility corridors. Habitat loss or degradation and direct mortality are some of the possible adverse impacts on lynx from these activities. Cumulatively, urbanization and highway development may impact connectivity in lynx habitat. Development of private lands often leads to increases in traffic volume, which may result in a negative influence on connectivity within the action area. Connectivity for lynx could be more seriously compromised by highway expansions. Even with implementation of the amendment, the role of the Forest Service in ameliorating the impacts of highway or private land development is limited. The amendment would, however, if it were applicable, require the Forest Service to consider land exchanges or acquisition, and coordinate with other agencies to lessen the impacts of development.

Future management of many private lands within the SRLA area is reasonably likely to have negative impacts on lynx habitat. Some snowshoe hare habitat would likely be permanently lost to development, and some would be reduced in quality through thinning or timber harvest. Not all lands would be developed or used in ways that have negative impacts on lynx habitat. Combined, private lands developed or used in ways that would have negative impacts on lynx habitat would constitute a fairly small proportion of lynx habitat within the SRLA area. Private land parcels are fairly small in size relative to the large landscape required by an individual lynx to support its home range and are scattered throughout the SRLA area. Many are, and would be adjacent to or interspersed with, Forest Service or other Federal land, and therefore some of the potential negative effects on the private parcels would be moderated by Federal land management.

The final rule did not find that present conditions on private lands threaten the contiguous U.S. DPS. As stated previously, the Forest Service manages the preponderance of lynx habitat within the SRLA area. Within the SRLA area, the proposed action substantively reduces the primary threat to lynx (inadequate regulatory mechanisms) by addressing the

major adverse impacts of Forest Service land management on lynx, as well as several other potential impacts or influences that do not rise to the level of a threat to lynx. Further, the proposed action would alleviate some of the adverse actions on private land, where lands are adjacent to Forest lands or within the same LAU. The Forest Service considers the condition of lynx habitat on private lands within LAUs, to the extent possible, in its assessment of baseline conditions during the development of projects for Forest lands, and adjusts its action to reduce negative effects in the LAU.

CONCLUSION

After reviewing the current status of Canada lynx, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of lynx within the contiguous United States DPS. No critical habitat has been designated for this species within the SRLA area, therefore none will be affected.

The proposed action incorporated much of the information in the LCAS and Science Report, a subset of the best commercial and scientific information available with which to analyze the effects of Federal land management on lynx. The LCAS incorporated a comprehensive amount of information available in 2000, including information contained in the Science Report and other information on lynx and forest management activities. The LCAS is currently being updated and clarified with new information from recent publications, investigations in progress, and improved knowledge of the distribution of lynx (J. Claar, pers. comm. 2006 *in* NRLA BO). However, new information supports primary conservation measures that conserve horizontal structure and that vegetation mosaics are essential components of lynx habitat. We conclude that the programmatic and project-level objectives, standards, and guidelines in the proposed action provide comprehensive conservation direction adequate to reduce most adverse effects to lynx from Forest management and to preclude jeopardy to the lynx DPS.

As stated in the final rule, we believe Plan amendments for those administrative units with lynx habitat are necessary for long-term conservation of habitat for lynx and its prey on National Forest System lands. Without programmatic guidance and planning to conserve lynx, assessment of land management effects to lynx and development of appropriate conservation strategies are left to project-specific analyses without consideration for larger landscape patterns.

The Service concludes that continued implementation of the Plans incorporating the amendments for lynx conservation may result in some level of adverse effects to lynx. However, the level of adverse effects to lynx are not reasonably expected to, directly or indirectly, reduce appreciably the likelihood of both the survival and recovery of the lynx DPS in the wild by reducing the reproduction, numbers, or distribution of lynx. Factors important in our assessment of jeopardy include, but are not limited to the following:

- Considering the environmental baseline for lynx, the final rule indicated that although several factors may be impacting lynx at smaller scales, only one factor was currently threatening the lynx DPS--inadequate Plans that reflect inadequate regulatory mechanisms. The proposed action addresses that threat through Forest management adequate to ensure long-term persistence of lynx in the provisional core area of the SRLA area.

- The proposed amendments considered information in the Science Report, LCAS, final listing rule, remanded determination of listing, recent research information, and the recovery outline for lynx. These documents outline the best available information concerning threats to lynx and means to address the threats.

- The recovery outline for lynx (U.S. Fish and Wildlife Service 2005) presents our current understanding of historical and current lynx distribution, ecology, population dynamics, and the relative importance of different areas to the persistence of lynx in the contiguous United States. We have determined that the proposed action is compatible with our understanding of recovery needs for lynx. As analyzed in this opinion, the proposed action addresses, in whole or in part, each of the applicable objectives in the recovery outline for lynx.

- The proposed action would immediately apply lynx management direction on nearly 7.6 million acres of lynx habitat. The proposed action would apply direction that would substantially reduce or eliminate adverse effects to lynx from Forest Service land management activities on at least 95.5 percent of this area.

- The lynx recovery outline is clear in its emphasis of concentrating lynx conservation measures in core areas, and the proposed action follows this guidance.

- One factor considered in this effects analysis was the uncertainty regarding the level and type of effects that land use management decisions at both project and programmatic levels may have on the contiguous United States lynx DPS. Researchers suggest that management Plans should thus be conservative regarding retention of known important lynx habitat components (McKelvey et al. 2000a). The proposed amendment meets this direction by addressing Forest land management actions that have the most potential to adversely affect essential lynx habitat components. The Service considers the retention of high quality snowshoe hare habitat in core areas to be essential to lynx conservation. The vegetation standards would be applied across at least 95.5 percent of lynx habitat. These standards directly address the major impacts to lynx habitat identified in research: harvesting forests and creating early stand initiation stages, pre-commercial thinning, and altering multistoried stands. Managing and moderating the impacts of these actions will maximize snowshoe hare production, thus benefiting lynx populations.

- The Forest Service has demonstrated a commitment toward partnerships for the conservation of lynx and lynx habitat on a programmatic level. In March 1998, the Forest Service, BLM, and NPS began a collaborative process with the Service to collect and analyze existing information on lynx (the Science Report) and assess the conservation needs of lynx and develop a lynx conservation strategy (LCAS) applicable to Federal land management. From 1999 through 2002, the Forest Service conducted extensive surveys to detect lynx presence on Forests across the contiguous U.S. lynx DPS (J. Claar, pers. comm. 2006 *in* NRLA BO). In 2006, the agencies initiated an update and clarification of the LCAS in order to incorporate new science and other information regarding the impacts of forest management on lynx.

- A large proportion of lynx habitat on Forest Service lands in the SRLA area (32 percent) occurs in lands with non-developmental status where management focuses on the maintenance of natural ecological processes, or conservation of rare ecological settings or components.

- Negative effects on lynx may not be totally eliminated, but are significantly reduced by the proposed management direction compared to the direction in existing Forest Plans. In at least 95.5 percent of lynx habitat in the SRLA area, vegetation management projects on Forest Service lands would be designed under the management direction and guidance of the proposed action to the point that they are likely to avoid adverse effects on lynx. Further, in the remaining 4.5 percent of this area, many fuels management projects can be designed in compliance or in partial compliance with the proposed standards and guidelines. Other project types that are likely to adversely affect lynx, such as recreation development, are constrained by standards mandating maintenance of connectivity (the major adverse impact) and affect a relatively small proportion of lynx habitat within the SRLA area.

- The adverse effects of the action to lynx due to the exemptions for fuels management and pre-commercial thinning in the WUI constitute a small portion of the lynx habitat in the SRLA area (3 percent per each Forest). The adverse effects of the action to lynx due to exceptions for pre-commercial thinning outside the WUI (no more than 1 percent per LAU) and other vegetation management (0.5 percent per each Forest) also constitute a small portion of the lynx habitat in the SRLA area. Monitoring and recording of fuels treatment actions are required as decisions are signed to ensure that the number of acres treated does not exceed these exemptions and exceptions.

- The proposed action is consistent with section 7(a)(1) of the Act through Forest Service commitments to undertake proactive management actions to benefit lynx.

INCIDENTAL TAKE

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of an incidental take statement.

In general, an incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize the impacts of the take and sets forth terms and conditions that must be complied with in order to implement the reasonable and prudent measures.

Amount or Extent of Take Anticipated

Forest Plans are permissive in that they allow, but do not authorize actions to occur. This biological opinion identifies management direction that allows for activities that adversely affect lynx. The proposed action reduces the potential for incidental take to occur as a result of actions implemented under the current Plans. However, at the broad scale of this consultation (seven National Forests), the Service is unable to anticipate all possible circumstances that may involve the take of lynx caused by the proposed action, with the exception of fuels and timber management (see below). The Service, therefore, conservatively anticipates that some low level of incidental take in the form of both harm and harass may occur from activities other than fuels and timber management. The Service believes that the level of take would be low because the proposed action considers the known habitat and environmental factors influencing lynx, and includes standards and guidelines that avoid or minimize adverse effects, as detailed in this biological opinion. However, it is not possible at this time to estimate incidental take of lynx likely to occur from the proposed management direction, since site specific information related to the number, type, timing, location, and other such details of projects conducted under the amendment is unknown. Consequently, all consideration of incidental take and any reasonable and prudent measures required to minimize its effect on the species addressed in this consultation is deferred to further consultation (Tier 2 biological opinions) on individual projects.

The exception to this deferral is take from fuel and timber management projects in lynx habitat. We anticipate that most of the take associated with implementation of the proposed action would occur when projects are conducted under the exemptions and exceptions to the vegetation standards **VEG S1, S2, S5 or S6**. We anticipate this take to be in the form of harm, as the exemptions allow modification of lynx habitat that would result in decreased production and density of snowshoe hares, their primary prey. The Service anticipates such incidental take of lynx will be difficult to detect for the following reasons:

- Lynx are wide-ranging, not easily detected in the wild.
- Although we have a general understanding of where lynx population centers are within the action area, the distribution of individual lynx across the SRLA area or at smaller scales within the area is not known.
- Although we have a general understanding that snowshoe hares occur and are widely distributed in lynx habitat across the action area, snowshoe hare densities across the SRLA area or at smaller scales within the area are not known.
- We lack information to accurately predict the number of snowshoe hares and alternate prey needed for the survival of adult lynx and their kittens.
- Snowshoe hares exhibit population cycles in Canada and, although not well understood, populations likely fluctuate in the United States as well. This variation could cloud our ability to demonstrate a direct cause and effect relationship. It may be difficult in many cases to determine whether mortality or injury of lynx is attributable to incidental take of lynx as a result of the proposed action, or whether it was natural mortality or injury of lynx due to natural declines in snowshoe hares.
- We lack information to predict with precision the densities of hares in various habitat and forest stands, before and after specific treatments, especially in relationship to the host of naturally occurring environmental variables that may affect hare densities.
- Discovery or detection of lynx injury or mortality attributed to habitat alteration is very unlikely.

All of these variables are difficult to monitor or census. According to Service policy, as stated in the Endangered Species Consultation Handbook (March 1998) (Handbook), some detectable measure of effect should be provided, such as the relative occurrence of the species or a surrogate species in the local community, or amount of habitat used by the species, to serve as a measure for take. Take also may be expressed as a change in habitat characteristics affecting the species, such as water quality or flow (Handbook, p 4-47 to 4-48). Because of the difficulty of estimating the precise number of lynx that would experience take in the manner described above, we have developed a surrogate measure to estimate the amount of anticipated take. The surrogate measure for the number of lynx harmed will be quantified using acres of occupied lynx habitat.

Because the Forest Service has provided explicit estimates on the number of acres that will be impacted by the proposed fuels and timber management within occupied lynx habitat, we are able to accurately assess take based on this surrogate metric. We have determined that many of the projects conducted under the exemptions and exceptions to vegetation standards

VEG S1, S2, S5 or S6 would result in take in the form of harm. Therefore, we are using the number of acres treated under these exemptions and exceptions under the proposed action as a detectable surrogate for the number of lynx taken in the form of harm. This approach is consistent with Service policy, as stated in the Endangered Species Consultation Handbook, that some detectable measure of effect should be provided, such as the relative occurrence of the species or a surrogate species in the local community, or amount of habitat used by the species, to serve as a measure for take.

This biological opinion anticipates the following amounts of take in the form of harm (modification of habitat that reduce the snowshoe hare prey base for lynx): treatment of up to 3 percent of lynx habitat (227,315 acres) over 15 years due to fuels management in WUI areas relating to exemptions to **VEG S1, S2, S5, or S6,** and no more than 1.5 percent (113,657 acres) of snowshoe hare foraging habitat due to vegetation management for other resource benefits relating to exceptions to **VEG S5 and S6. Exception 4 in VEG S6** is generally not anticipated to result in take, given the guidelines for this exception. In the event that take is anticipated in future projects, those effects will be addressed in a second tier biological opinion, as needed. Because the exemptions and exceptions are limited to a total of no more than 4.5 percent of all lynx habitat in the SRLA area, the decrease in prey base would translate to a low level of impairment of reproduction and feeding during some years. Specifically, we anticipate that some adult female lynx within home ranges affected by such projects may fail to complete a pregnancy or would be less successful in finding adequate food resources needed to ensure maximum survival potential for kittens. Thus, we expect reproductive impairment and kitten survival to be impacted.

Effect of Take

To give perspective on what these losses mean to lynx, the average lynx territory in the SRLA area ranges from 15 to 50 square miles (Reudiger et al. 2000). The proposed action limits adverse fuel treatments allowed in the WUI to total no more than 3 percent of lynx habitat per Forest (227,315 acres) over 15 years due to fuels management in WUI areas relating to exemptions to **VEG S1, S2, S5, or S6,** and no more than 1.5 percent (113,657 acres) of snowshoe hare foraging habitat due to vegetation management for other resource benefits either within or outside the WUI relating to exceptions to **VEG S5 and S6.** The proposed action limits fuels treatments that are exempt from **VEG S1** (i.e., more than 30 percent of the LAU in the stand initiation structural stage) to no more than 3 adjacent LAUs. The impacts from fuels treatments and vegetation management would be distributed across the Forests, therefore the number of individual lynx home ranges that would be affected would be low. Also, even in areas treated through exemptions and exceptions, the level of reduction in snowshoe hare prey base will vary depending upon site conditions, and thus would not always result in take of lynx.

In the accompanying biological opinion, the Service has determined that this level of anticipated take is not likely to result in jeopardy to the species.

Reasonable and Prudent Measure

The Service believes that the following reasonable and prudent measure is necessary and appropriate to minimize impacts of incidental take of lynx:

RPM #1: The Forest Service shall minimize harm of lynx from pre-commercial thinning and other vegetation management projects by ensuring that lynx home ranges, as represented by LAUs, either retain sufficient lynx habitat (when sufficient lynx habitat already exists in an LAU) or lynx habitat is not substantially reduced (when sufficient lynx habitat does not already exist in an LAU).

Terms and Conditions

To be exempt from the prohibitions of section 9 of the Act, the Forest Service must comply with the following terms and conditions, which implement the reasonable and prudent measure described above and outline reporting and monitoring requirements. These terms and conditions are non-discretionary.

The following terms and conditions implement reasonable and prudent measure #1:

1. The Forest Service shall ensure that timber management projects conducted under the exemptions and exceptions from Standards **VEG S1, S2, S5 or S6** in occupied habitat do not occur in greater than 4.5 percent of lynx habitat on any Forest (340,972 acres total in SRLA area) for the life of the amendment (15 years).

2. In lynx habitat, pre-commercial thinning and vegetation management projects allowed per the exceptions listed under **VEG S5 and S6** shall not occur in any LAU in which **VEG S1** is exceeded (i.e., no more than 30 percent of LAU in stand initiation structural stage), except for protection of structures.

Monitoring and Reporting Requirement

The Forest Service Rocky Mountain Region (Region 2) Office in Lakewood shall provide a written annual report to the Service each year this biological opinion is in effect. The report will include a summary of the reporting requirements listed below. The report shall be submitted to the Service by April 1 of each year, or other date through mutual agreement. This report will be used as the basis for an annual determination made by the Service as to whether Forest Service actions are being conducted within the parameters of this biological opinion. These annual determinations will be issued by the Service after meeting with the Forest Service to discuss the reported results.

The report to the Service shall document the following information related to fuel treatment and vegetation management projects occurring in lynx habitat:

1) To ensure that term and condition 1 has not been exceeded in any administrative unit, report the acres per Forest and LAU of lynx habitat treated through fuel treatment projects, within and outside the WUI (as defined by HFRA). Report whether or not fuel treatment projects met the vegetation standards and guidelines. If standards or guidelines were not met, report those which were not met and include which exemptions or exceptions were used, how many acres were affected, and why the standards or guidelines could not be met.

2) Monitoring requirements shall be reported to the designated Forest Service office with responsibility for maintaining an accurate accounting of reports at the time the project decision is signed. This requirement ensures that projects do not treat more than 4.5 percent of lynx habitat per Forest under exemptions and exceptions to the vegetation standards, as described in the proposed action and term and condition 1 of this incidental take statement. This reporting requirement is found, in part, in the proposed action and is also a requirement of this biological opinion. The report will be provided in a format jointly agreed to by the Forest Service and the Service.

The following monitoring requirement is partially required by the proposed action, and would allow us to gauge the validity of our assumptions and those in the BA (Forest Service 2008) that suggest guidelines would be implemented in most cases:

3) The Forest Service shall document, in the annual report to the Service, the rationale for deviations from guidelines. The Environmental Impact Statement defines a "guideline" as follows: A guideline is a particular management action that should be used to meet an objective found in a land management Plan. The rationale for deviations ***may be*** documented [emphasis added], but amending the Plan is not required. Application of specific guidelines in some cases may further minimize the impact of, or potential for, take. This monitoring requirement requires the Forest Service to document the rationale in all cases. The Service will annually review the documentation regarding deviations from the guidelines and will work with the Forest Service to develop corrective measures, as appropriate.

The annual report should be submitted to the Service's Colorado Field Office in Lakewood. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The anticipated level of incidental take exempted in this incidental take statement is quantified through the use of the surrogate measures of up to 227,315 acres treated through exemptions to vegetation standards for fuels management (**VEG S1, S2, S5, or S6**), and no more than 113,657 acres of lynx habitat treated through exceptions to **VEG S5 and S6** for vegetation treatment projects over a 15 year period. If, during the course of this action, these limits on acres treated are exceeded in the SRLA area, the Service will determine if the level of anticipated incidental take has been exceeded. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent

measures provided. The Forest Service must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

1. In the event a lynx or any other Federally-listed species is killed or injured during project activities, the Colorado Field Office of the Service in Lakewood (303-236-4773) or Grand Junction (970-243-2778) or the Wyoming Field Office of the Service (307-772-2374) should be contacted within ten (10) days.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal Agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery programs, or to develop information.

1. The Service commends the Forest Service for initiating important efforts to increase our understanding of lynx and lynx habitat with completion of the Science Report, lynx habitat mapping, linkage zone identification, and assuming leadership roles on both the Lynx Biology Team and Lynx Steering Committee. We recommend that you continue to be a leader in these arenas, and to the extent possible, alone and/or in coordination/cooperation with other Federal, State, or private entities, work to fulfill the following key items identified in the lynx recovery outline to gain additional information that could be useful in managing lynx: 6.6.1, 6.6.2, 6.6.3, 6.6.5.

2. The Service recommends the Forest Service continue to use their authority to enhance the logistical and financial support of the Colorado Division of Wildlife's management efforts and current and future research needs evaluating the impacts of activities including, but not limited to ski areas, encroachment and impact of right-of-way authorizations, and highway easements on lynx and their habitat.

3. The Service believes that a certain level of dispersed recreational use in some areas under Forest Service management (e.g., Vail Pass Winter Recreation Area) has the potential to contribute to barrier effects to wildlife, including lynx. At this time, the exact level at which adverse effects occur to lynx or their habitat has not been determined. We recommend that the Forest Service, in conjunction with, and with financial support of partners, conduct an analysis, as well as any associated research deemed appropriate to address this issue. We recommend that the Forest Service develop and implement a strategy that combines analysis of level of use, and different seasons of use, with relevant research to establish management techniques that minimize impacts to lynx. We believe this strategy should be implemented for large-

scale (e.g., Land Use Plans/Forest Plan level) travel management analyses and areas of known high dispersed recreational use, which have a high potential to substantially affect lynx behavior, movement patterns, ecology, etc. The analysis should take into account the existing landscape and any anthropogenic factors that may influence lynx behavior, such as high use roads, highways, ski areas, and populated areas. In addition, we recommend that the analysis described above should not wait for initiation of a specific proposed action, but should be initiated as soon as practicable.

4. The Forest Service and the Service will jointly develop Implementation Guidelines that will provide more detailed information to the Forests on the implementation of the proposed action. The Implementation Guidelines should be developed by a technical subcommittee with members from each agency and should be prepared within six months of the issuance of the Record of Decision.

5. The Forest Service and the Service will continue to jointly update the lynx habitat maps within the SRLA area.

REINITIATION REQUIREMENT

This concludes formal consultation on the proposed action outlined in your request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

We appreciate your continued cooperation in meeting our joint responsibilities under the Endangered Species Act. If you have questions or comments regarding this biological opinion, please contact Leslie Ellwood at (303) 236-4747 or Kurt Broderdorp at (970) 243-2778.

Sincerely,

Susan C. Linner
Colorado Field Supervisor

cc: FWS/ES/CFO-GJ (K. Broderdorp)
FWS/ES/MFO (A. Vandehey)
Ref: Lynx\SRLA\SRLA BO_Supplemental_Final 07 24 08

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Appendix A. History of Canada Lynx Road Mortalities within the Continental U.S.

Colorado Road Mortalities Since 1999			
Lynx	Date	General Location	Traffic Volume (AADT)
AK99F17	7/22/1999	Wolf Creek Pass area Highway 160 MP 172-172.5	2325
BC00F5	3/16/2002	I-70 East of Eisenhower Tunnel, Herman Gulch	27600
BC03F03	5/19/2005	I-70 2 miles west of Vail Pass	approx. 20,000
BC05M06	7/29/2005	Highway 550 S of Molas Pass MP 48.5 near DMR	4100
BC99F6	7/19/1999	U.S 550 South of Montrose MP 112.5	3300-4200
CO04M14	5/12/2005	Hwy 17 near Horca, lynx kitten ~ 11 months old	480-1100
QU04F04	5/17/2004	Vail Pass I-70	19000
QU04F05	8/26/2005	New Mexico (released in Colorado)	Unknown
YK00F6	8/17/2000	I-70 MP 221 Bakerville	24730
YK00F8	12/22/2000	Highway 550 Red Mtn Pass MP 80.75, N of Silverton	1407
YK00M3	9/30/2005	Kansas (released in Colorado)	unknown

Minnesota Road Related Mortality				
Date	Location	Traffic Volume (VPD)	Speed Limit	Highway
07/02/2003	T64N R01E Sec 32, Cook County	1350	50	County Highway 12

08/01/2003	T156N R39W Sec 12, Marshall County	475	?	County Highway 54
07/01/2004	T62N R03E Sec 27, Cook County	2250	55	State Highway 61
12/10/2004	T40N R21W Sec 15, Pine County	19400	70	Interstate 35
04/20/2005	T59N R08W Sec 10, Lake County	19	NOT POSTED; 30 MPH DESIGN SPEED	FR 172

MAINE Road Related Mortality					
Date	Township	Location	Type of road	Road Speed	Traffic volume
7/28/2000	Portage	¼ mile in on West Cottage Road	Secondary, dead-end, state/municipal, paved	<45 mph	? <200 vehicles/day
9/19/2002	T17 R13 WELS	Robichaud Road	Private, two-lane, gravel, forest haul road	45-50 mph	? 200vehicles/day
8/19/2003	T11 R12	Realty Road (mi. 51)	Private, two lane, gravel, forest haul road	45-50 mph	?200-400 vehicles/day
8/9/2004	Nashville Plantation	Beaver Brook Road, 200 yards east of Rt. 11 intersection	Private, two lane, gravel, forest haul road	40 mph	? 50 vehicles/day
9/5/2004	T13 R9 WELS	Rocky Brook Road (mi. 21.5)	Private, two lane, gravel, forest haul road	40 mph	? 100 vehicles/day
10/5/2004	T16 R13	Estcourt (Irving Road) 1 mi. S. of Chementicook Stream	Private, two lane, gravel, forest haul road	45 mph	? 200 vehicles/day
6/20/2005	T14 R7	Wilderness	Private, two	45	? 200

	WELS	ISLAND ROAD (NEAR FERGUSON CROSSING)	LANE, GRAVEL, FOREST HAUL ROAD	MPH	VEHICLES/DAY
7/26/2005	T13 R5 WELS	BEAVER BROOK ROAD (~4 MI. E. OF RT. 11)	PRIVATE, TWO LANE, GRAVEL, FOREST HAUL ROAD	40 MPH	? 100 VEHICLES/DAY
8/1/05	T10 R9	JACK MOUNTAIN RD. (BETWEEN MILE 14 AND 15)	PRIVATE, TWO LANE, GRAVEL, FOREST HAUL ROAD	40 MPH	? 200 VEHICLES/DAY
2/13/06	T16 R4	RT. 161 (NEAR MADAWASKA L.)	PRIMARY, TWO-LANE, PAVED, STATE HIGHWAY	50 MPH	1500 VEHICLES/DAY

ADDITIONAL NOTE: ONE ROAD KILL WAS REPORTED IN IDAHO FROM 1972, WHICH OCCURRED ON HIGHWAY 12 NEAR NOSEEUM CREEK. TRAFFIC VOLUME ON THIS ROAD IN THE YEAR 2000, WAS APPROXIMATELY 600 VEHICLES PER DAY. THEREFORE TRAFFIC VOLUME IN 1972 WAS LIKELY MUCH LOWER (BRYON HOLT, PERS COMM. 2007).

INFORMATION IN THIS APPENDIX COMPILED BY KURT BRODERDORP, U.S. FISH AND WILDLIFE BIOLOGIST.